A Dissertation on

"A STUDY OF POST-MORTEM ARTEFACTS IN DEATHS AUTOPSIED AT GOVT. KILPAUK MEDICAL COLLEGE CHENNAI IN THE YEAR 2017"

Submitted to

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THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY,

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2016 - 2019

BONA-FIDE CERTIFICATE

This is to certify that this dissertation titled **"A STUDY OF POST-MORTEM ARTEFACTS IN DEATHS AUTOPSIED AT GOVT. KILPAUK MEDICAL COLLEGE CHENNAI IN THE YEAR 2017"** is a bona-fide original work done by **Dr. J. S. RAGHU DEEPAN,** Post graduate in Department of Forensic Medicine Govt. Kilpauk Medical College Chennai, in partial fulfillment of the regulations of the Tamilnadu Dr. M.G.R. Medical University for the award of M.D. Degree in Forensic medicine (Branch XIV)

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CERTIFICATE

This is to certify that this dissertation titled **"A STUDY OF POST-MORTEM ARTEFACTS IN DEATHS AUTOPSIED AT GOVT. KILPAUK MEDICAL COLLEGE CHENNAI IN THE YEAR 2017"** submitted by **Dr. J.S.RAGHU DEEPAN** is an original work done in the Department of Forensic Medicine, Government Kilpauk Medical College and hospital , Chennai in partial fulfillment of regulations of The Tamil Nadu Dr. M.G.R. Medical University, for the award of degree of M.D. (FORENSIC MEDICINE) Branch – XIV, under my supervision during the academic period 2016-2019.

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DECLARATION

I, **Dr. J. S. RAGHU DEEPAN,** solemnly declare that the dissertation on **"A STUDY OF POST-MORTEM ARTEFACTS IN DEATHS AUTOPSIED AT GOVT. KILPAUK MEDICAL COLLEGE CHENNAI IN THE YEAR 2017"** is a bona-fide work done by me during the period of January 2017 to December 2017 at Government Kilpauk Medical College and Hospital, under the expert Supervision of **Dr. R. SELVAKUMAR, M.D,** Professor and Head of Department of Forensic Medicine, Government Kilpauk Medical College, Chennai. This thesis is submitted to The Tamil Nadu Dr .M.G.R. Medical University towards partial fulfillment of the rules and regulations for the M.D. degree examinations in Forensic Medicine to be held in April 2019.

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CERTIFICATE - II

This is to certify that this dissertation work titled **"A STUDY OF POST-MORTEM ARTEFACTS IN DEATHS AUTOPSIED AT GOVT. KILPAUK MEDICAL COLLEGE CHENNAI IN THE YEAR 2017"** of the candidate **Dr. J. S. RAGHU DEEPAN** with registration Number **201624152** for the award of **M.D. degree** in the branch of **FORENSIC MEDICINE.** I personally verified the urkund.com website for the purpose of plagiarism Check. I found that the uploaded thesis file contains from introduction to conclusion **38 pages** and result shows **9 percentage** of plagiarism in the dissertation.

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ABSTRACT

AIM OF THE STUDY:

- To study the prevalence of post-mortem artefacts.
- To profile the various factors contributing to the post-mortem artefacts.
- To suggest preventive measures to minimize post-mortem artefacts.

OBJECTIVES OF THE STUDY:

- To differentiate an ante-mortem injury from a post-mortem artifact.
- To indentify the most common post-mortem artifact.
- To enumerate the various factors leading to the post-mortem artefacts.
- To identify the most common reason for artifact formation.
- To recognize what are the precautions to be taken to minimize artefacts.

Methodology:

The present work is a cross-sectional study of artefacts in all the autopsies conducted in the Department of Forensic Medicine & Toxicology, Govt. Kilpauk Medical College & Hospital between January 2017 and December 2017.

Results:

During this study period, out of 2866 cases that came for autopsy, 358 cases were selected by simple randomization and were studied. Out of the 358 cases, presence of artefacts was confirmed in 122 cases which accounted for 34%. Maximum number of artefacts was noted among male sex in 41-50 years age group, in the south-west monsoon season, more commonly in the month of June.

Artefacts are more frequently seen in the sudden deaths, those deaths occurring in the evening time period, those having a wide post-mortem interval of more than 36 hours and in those bodies retrieved on the roadside.

Unknown dead bodies, hospital treated deaths and decomposed bodies are more susceptible for artefact formation.

Among the 122 cases positive for artefacts, artefacts were introduced before autopsy in 102 cases (83.7%), while in 20 cases it was introduced during autopsy (16.3%). Among the 102 artefacts identified as introduced between death and autopsy, 7 were identified as agonal artefacts (6.9%), 32 were due to post-mortem changes(31.4%), 44 were third party artefacts (43.1%), while 5 were due to environmental causes (4.9%) and 14 cases accounted for miscellaneous artefacts (13.7%). Maggots activity were the most common artefact accounting for 12 cases (11.7%) followed by ant bite marks which were seen in 11 cases (10.7%). The artefacts due to decomposition changes were the second most common artefact of which, the oozing of Post-Mortem fluid is the major decomposition artefact.

Toxicological artefacts like contamination of blood with pericardial fluid, gastric contents while collecting and mixing with wrong preservative were noted in 3 cases that contributed for 15.0% of the artefacts introduced during autopsy.

Keywords: Artefacts, Factors, Unknown Bodies, Treated Bodies, Therapeutic Artefact, Decomposition Artefact, Agonal Artefacts, Anthrapophagy, Third Party Artefact, Environmental Artefact, Refrigeration Artefact, Transportation Artefact, Artefacts During Autopsy.

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INTRODUCTION

The word ‘artefact’ is derived from the Latin words, *arte*, meaning ‘by skill’ and *factum*, meaning ‘things made’.[1] Thus the word ‘artifact’, literally refers to those things that are made artificially by skill. An artefact is any structure or feature that is not natural, but has been altered by processing.

The Post-Mortem artefact is defined as “any change caused or any feature introduced into the body after death (accidental or physiologically unrelated finding to the natural state of the body), that is likely to lead to misinterpretation of medically significant ante-mortem findings”.[2]

In other words, Post-Mortem Artefact is any alteration or introduction of new features into the dead body, which is physiologically and pathologically unrelated to its natural state and is likely to cause misinterpretations for the investigators or for a layman who is unfamiliar with this phenomenon.

The medico-legal autopsy is best done by the prudent combination of theoretical and practical knowledge. A good medical examiner is one who has not merely a vast experience in conducting autopsies, but one who has trained himself to make precise and correct interpretation of the findings. Hence, the doctor conducting the autopsy carries great responsibility over his shoulders. It is obvious that if he is unable to furnish proper interpretation of the findings, the pangs of justice will be disturbed and, therefore, it is imperative that all unusual findings must be meticulously examined and photographed and if need

be, some experienced, better qualified colleague may be approached there and then since, as stated earlier, a poor opinion is worse than no opinion at all.

The doctor should learn to draw conclusions logically and rationally instead of forming hasty judgment. Further, if he misinterprets the findings, he will have to face rough time in the court during the cross-examination, if the defence counsel incidentally being aware of these pitfalls attempts to discredit the evidence.[3]

The artefacts, to some extent, are observer-dependent, in as much as a same finding may confuse a beginner, but may easily detected as spurious or an 'artefact' by an expert.[1] Such artifact may be introduced before death, at the time of death or after the death.[3] It is imperative for the autopsy surgeons to know the various types of artifacts, so that erroneous diagnosis and wrong conclusions may be avoided.

This study primarily focuses on the distribution of various types of post-mortem artefacts and the most common ones among them and how each artifact can be ruled out in the post-mortem examination. It also focuses on those factors which might influence the formation of artefacts to highlight the preventive measures that can be taken to minimize artefacts. This would be of great help to all the doctors who would be undertaking post-mortem examination and thereby to the society in establishing justice.

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JUSTIFICATION FOR THE STUDY

Ignorance of knowledge of artefacts may lead to:

- Wrong interpretation of cause of death.
- Wrong interpretation of manner of death.
- Wrong interpretation about time since death.
- Undue suspicion of criminal offense.
- A halt in investigation of criminal death.
- Wastage of time and effort as a result of misleading findings.
- It may lead to miscarriage of justice.[4]

Relatives of the deceased are often laymen and when they note artefacts, they may raise wrongful allegations like assault, rape, etc. It is not always easy for a doctor explain these artefacts and convince the angry relatives in their mindset. The relatives may threaten the doctors by not receiving the dead body. They may even use the dead body to engage in a protest in front of hospital/ public for wrongful accusation over the doctors.

The media, not knowing full details of the situation, may take sides with the public and misinterpret the situation causing more problem for the doctors. The agitated relatives may harass the doctors alleging them to be complacent in their duties and at times assault them as they are soft targets.[5]

The issue gets further complicated because most of the medico-legal autopsies in India are carried by MBBS graduated medical officers without any special training in the field of Forensic Medicine & Toxicology.[5]

A doctor conducting the medico-legal autopsy without the knowledge of artefacts may mislead the investigating officer, at times, to book suspects under S. 302 I.P.C. (punishment for murder) or S. 375 I.P.C. (punishment for rape) leading to wrongful allegation over an innocent.

Yet the artefacts are least studied and less documented in forensic literature. These factors necessitate the study of these artefacts encountered in medico-legal autopsy.

REVIEW OF LITERATURE

The medico-legal autopsy is performed on behalf of the state. The aims of medico legal post-mortem examination are much broader than those of the clinical autopsy.[6] The first crucial part of any medico legal post-mortem examination is observation and documentation of the findings present in the dead body and these skills should lie within the competence of almost every doctor.[6]

Forensic pathology can only be learned by experience but no account would be complete without drawing attention to common artefacts found at autopsy, which can mislead the medical examiner with insufficient forensic experience and even lead to miscarriage of justice.[7] Some of the 'classic' mistakes have been described right from many years ago, but each generation of Forensic Pathologist discovers them anew – or what is worse, fails to discover them.[7,8,9]

Artefacts can arise from a multitude of causes like Post-Mortem changes, therapeutic/resuscitative effects, inhumation, embalming procedures, environmental factors like heat, cold, insect / animal activity, shifting process or refrigeration and even due to the procedures followed during autopsy apart from the faulty techniques, sampling and human errors.

Classification of artefacts:

Based on the period of introduction of artefacts into the body, artefacts are primarily classified into

(a) Those introduced between death and post-mortem examination.

(b) Those introduced during post-mortem examination.[2]

Both these types are further classified into various sub-types based on the mechanism of the artifact formation.

Post-Mortem artefacts may be classified as follows based on the cause of the artifact formation.

(a) Encountered during Post-Mortem examination

(b) Artefacts of decomposition

(c) Third party artefacts

(d) Artefacts of environment

(e) Other artefacts.[4]

The artefacts encountered in post-mortem examination are also classified as following three types, wherein therapeutic artefacts are considered as an ante-mortem artifact as they are introduced, while the person is still alive.

(a) Those introduced prior to death – (therapeutic artefacts)

(b) Those occurring during the process of death – (agonal artefacts)

(c) Those introduced after death – (other artefacts).[3]

Though all these are justifiable, it becomes difficult to have different classifications for the same artefacts. For the convenience of our easy

understanding and analysis, the above mentioned classifications can be combined as follows:-

1. Artefacts introduced between death and Post-Mortem examination

(a) Agonal artefacts[1]

(b) Artefacts due to Post-Mortem changes[10]

- Related to rigor mortis
- Related to hypostasis
- Related to autolysis
- Related to putrefaction

(c) Third party artefacts[4]

- Insect / animal activity
- Therapeutic / resuscitative artefacts
- Deliberate mutilation / dismemberment
- Embalming artefacts

(d) Environmental artefacts[10]

- Effects of heat
- Post-Mortem corrosion
- Post-Mortem maceration

(e) Miscellaneous artefacts

- Refrigeration artefacts
- Mishandling of the body
- Interment and exhumation artefacts[2]
- Due to delay in autopsy[10,11]

- Toxicological artefacts

- Artefacts associated with accidental deaths

2. Artefacts introduced during autopsy/ Autopsy pathologist induced artefacts[10]

- Air in blood vessels

- Skull fractures[12]

- Visceral damage

- Injury to blood vessels

- Extravasation of blood

- Fracture of hyoid bone

- Toxicological artefacts

Agonal artefacts:

Agonal period is the time interval between cardio-pulmonary arrest and brain dysfunction or actual death.[13]

1. Regurgitation and aspiration of gastric contents is a common agonal artifact. It may be seen in natural deaths, as a terminal event or due to handling of the body, or due to resuscitation.[2] Gastric contents in respiratory tract are commonly found at Post-Mortem in acute alcoholism, occasionally during epileptic fit, and in dead bodies that have started decomposing.[14] According to Saukko and Knight, there is no reliable method of distinguishing agonal or even early Post-Mortem over-spill from true vital aspiration unless clinical or other witnessed evidence is available.[7] On the other hand, according to Modi, vomited

matter may regurgitate into the larynx and by inspiratory efforts may be aspirated into the smaller bronchioles so as to result in suffocation. If there is Post-Mortem spill, these contents cannot reach the smaller bronchi and bronchioles.[15] In case of doubt, a study of lung tissue by histo-pathological examination is of help; if the food particles are found beyond the secondary bronchioles, it indicates that the inhaled food particles are ante-mortem in origin.[13]

2. One of the effects of asphyxia is to cause vomiting due to medullary anoxia. vomited material is inhaled by a victim in a state of unconsciousness or under the influence of drink, drug, and anesthesia or during the fit of epilepsy[16] and is most common in patients who have impaired functioning of central nervous system.[17] In case of choking, the particles may be drawn into the bronchioles, which distinguishes the condition from those that forces the food up the esophagus and falls in the larynx after death.[2]
3. Absence of appreciable hemorrhage does not necessarily indicate its Post-Mortem origin nor does the presence of extravasated blood into the tissues always suggest its Ante-Mortem origin. During the terminal moments of life, the victim may pass rapidly into vascular collapse or shock, which may prevent any significant bleeding to occur. An individual may collapse and die along the roadside and may subsequently be run over by some vehicle, leading on to collection of blood in the body cavities and some into the tissues too.[3,12,13] However

certain events cannot happen after death like pavementation and exudation of WBCs, proliferation of fixed tissue cells, formation of significant amount of carboxy hemoglobin, formation of laminated thrombi, migration of emboli.[13]

4. Oesophagogastromalacia is rarely seen in persons who die within hours or days after receiving severe head injury with cerebral damage[2] or have terminal pyrexias[1]. This occurs due to auto-digestion by pepsinogen and hydrochloric acid released by the gastric cells causing auto-digestion of the gastric mucosa (gastromalacia) and sometimes distal 1/3rd of the esophagus due to relaxation of lower esophageal sphincter (esophagomalacia)[1]. The stomach contents are spilled into left sub-phrenic area or left chest cavity respectively. The tissue affected is grayish white to black and very friable. It may occur immediately before or shortly after death. It is an agonal or Post-Mortem artifact.[2]

In a study conducted by T. Sai Sudheer[18] in Kurnool, Andra Pradesh, agonal artefacts which were identified as absence of inflamed mucosa, tracheo-bronchial secretions with the mere presence of food particles in the upper respiratory passage which could not be seen in terminal bronchioles accounted for 19%.

In his case report, HS Tatiya[19] documented a case of agonal artefact due to regurgitation of gastric contents which proved a great dilemma in

arriving at the cause of death and discussed in detail regarding the various factors that guided him in arriving at the conclusion.

Artefacts due to Post-Mortem changes:

Related to rigor mortis

1. Rigor mortis of the heart may simulate concentric hypertrophy of the heart.[20,21]
2. Rigor in pylorus of stomach causes it to be unduly firm and contracted.[2,4]
3. Unequal size of the pupils.
4. Five o'clock shadow (growth of beard).
5. Semen at tip of penis.[1]
6. Rigor in stomach may accentuate rugae or fix a point of contraction so as to give a pseudo-hourglass, which is readily removed by traction.[2]
7. Secondary relaxation of heart may mimic pathologic dilatation.[1,20,21]

Related to hypostasis

1. Pinpoint foci of extravasated blood from burst capillaries in areas of intense livor may simulate Ante-Mortem petechial hemorrhages.[4]
2. Post-Mortem hypostasis of internal organs may simulate Ante-Mortem contusion[4] or may be mistaken for congestion due to disease.[13]
3. Banding of esophagus may be seen especially when the tissues are congested. These bands are pale areas in mucosa caused by Post-Mortem hypostasis being prevented from settling down due to regional

anatomical architecture and curves of esophagus. These bands may be mistaken for injury.[2,4]

4. The color of the hypostasis may change in some poisoning.[2]
5. Patches of hemorrhages (called as Prinsloo and Gordon artefact)[1] can occur in tissues behind esophagus at the level of the larynx, caused by the distension and leakage of the venus plexuses in this area, which might be mistaken for strangulation.[2]
6. The face may show hemorrhages when the head is dependent.[2]
7. Infection combined with DIC sometimes causes blotchy, pink, purplish or red rashes which may be mistaken for bruises.[1]
8. The Post-Mortem staining may simulate effects of coronary occlusion in heart, pneumonia in lungs, irritation due to poisoning in gastro-intestinal tract.[13]

Related to autolysis

1. Autolytic rupture of stomach can occur Post-Mortem with release of the stomach-contents into the peritoneal cavity.[3,12]
2. Pancreas too, may undergo autolysis due to proteolytic enzymes within it. This occurs due to the autolysis of endothelial cells, leading to separation from one another and resultant escape of haemolysed blood into surrounding tissues.[13] The pancreatic parenchyma may show generalized or multifocal areas of reddish-brown discoloration and can be mistaken for pancreatitis. However, histology will be helpful in resolving

the tissue.[3,12] Inflammatory reaction and fat necrosis are absent in such cases.[2,13]

Related to putrefaction

Decomposition of the body may lead to production of most common and perhaps the most significant of the artefacts.[3,12]

1. Bloating, discoloration and blistering of a body may be mistaken for disease or injury. Dark bluish discoloration areas may be mistaken for bruising.
2. Distension of parts of the body having loose tissues like tips, eyelids, breasts, penile and scrotal regions and protrusions of tongue, may impart false sense of obesity.
3. Expulsion of blood-tinged fluid from the mouth and nose may be mistaken as bleeding originating during life.
4. If the deceased were wearing tight clothing or having a neck-tie, a groove may appear around the neck and this along with bulging of the eyes and protrusion of the tongue may be mistaken for strangulation.
5. Fissures or splits formed in the skin during decomposition may simulate incisions or lacerations.
6. Expulsion of semen or vaginal discharge due to pressure of putrefying gases may wrongly suggest involvement of sexual activities with the cause of death.
7. Marked bluish discoloration of the loops of intestines especially in the pelvic cavity may not be mistaken for infracted bowel.[3,12]

8. Post-Mortem dilatations and flaccidity of vagina or anus may produce the appearance of sexual assault.
9. Post-Mortem separation of child's skull suture by putrefaction gases may be misinterpreted as fracture.
10. Internal hypostasis with hemolysis in meninges may resemble hemorrhage.
11. The presence of decomposed bloody fluid in chest may be misinterpreted as pleural effusion/hemothorax.
12. Bursting of abdomen with protrusion of abdominal contents due to decomposition may be mistaken for abdominal trauma.
13. Accumulation of blood in the tissues of neck in drowning may simulate Ante-Mortem hemorrhage due to strangulation.[4]
14. Displacement of internal pools of blood by pressure of gases of decomposition produces pseudo-bruising.
15. Internal hypostasis with hemolysis of red cells may resemble hemorrhage, especially in meninges, kidneys and retroperitoneal tissues.
16. In a dead body lying in supine position, due to lysis of red cells and breakdown of vessels, blood seeps into the soft tissues of scalp, appearing as a confluent bruising.
17. Blebs formed during putrefaction may be mistaken for blebs from burns.
18. Lungs may show Post-Mortem bacterial colonies.
19. In advanced decomposition, small military granules or plaques, 1-3 mm in diameter may be seen on serous or endothelial surfaces of body such

as pleura, peritoneum, pericardium and endocardium. They consist of calcium, fat, endothelial cells and bacteria and should not be mistaken for inflammatory lesions or effect of a poison[2] or military tuberculosis.[1]

20. Some poisons are destroyed by putrefaction and some appear due to putrefaction.[1]
21. Dehiscence of remote surgical incisions.[1]
22. Gas bubbles in blood is an early sign of decomposition. Air in the right side of heart may be mistaken for air embolism; can be ruled out by pyrogallol test.[1]
23. Softening of 'synchondrosis' between the body and greater cornuae of hyoid bone producing abnormal mobility may be confused as fracture.[13]

Post-Mortem changes are well known for their possible misinterpretation as traumatic lesions which can mislead to suspicion of violent death and therefore to a forensic autopsy request.[22] There are considerable studies in both India as well as other countries relating to the artefacts related to Post-Mortem changes, as they are relatively more common as compared to other types of artefacts. Most of these studies discusses about the artefacts due to putrefaction/ decomposition while there are few case reports of artefacts related to rigor mortis and lividity as well.

In a study conducted by Sauvageau A[22], Post-Mortem artifacts mistaken for traumatic lesions were found in 18 cases out of 51 decomposed bodies among the 230 total cases studied. These misinterpretations were based on 5 categories of Post-Mortem changes: purge fluid drainage in 12 cases (66.7%), bluish discoloration by lividity in 5 cases (27.8%), parchment-like drying of the skin in 4 cases (22.2%), bloating from gas formation in 4 cases (22.2%), and skin slippage in 1 case (5.56%). Therefore, Post-Mortem artifacts misinterpretation occurred in 7.83% (95% confidence interval 0.05-0.12) of all requested forensic autopsies and in 35.29% (95% confidence interval 0.23-0.50) of decomposed autopsy cases.

Post-Mortem artefacts due to scrotal mummification (1 case)[23], 2 cases of Post-Mortem bleeding artefact by hemorrhoids[24] and 1 case of Post-Mortem extravasation of blood simulating facial bruising[25] have been reported.

In a study conducted at Kurnool, among 1150 cases of post mortem examination, 74 cases were with artefacts constituting 5.13% of total autopsies of which artefacts due to decomposition (35%) are the major contributor in one year, followed by breaking of rigor due to handling of the bodies in (19%), followed by artefacts in burns case (16%), artefacts due to animal and insect activity (15%), due to therapeutic and resuscitation artefacts in 12% and lastly due to faulty techniques in 3% cases.[18]

Similarly, in a study conducted at Karachi, Post-Mortem artifacts due to decomposition is seen maximally, in 78 cases out of 229 total cases positive for artefacts.[26] In 10 decomposed bodies deep grooves were seen around the neck due to tight collars simulating ligature marks as seen in strangulation and hanging. In 12 decomposed bodies fissures and splits were seen in the skin due to decomposition which could easily have been mistaken for lacerated or incised wounds.

Dr. Gaurav sharma, in his paper, discussed a case of abnormal distensibility of rectum/ vulva/ vagina, wherein there was inversion of uterus along with Post-Mortem delivery due to decomposition.[27]

Likewise, Dr. HT Thejaswi has reported a case of hanging where the darkening of the body was due to the Post-Mortem staining over dependent parts like face, chest, abdomen and both upper limbs were alleged as due to assault, poisoning and murder by the relatives.[5] A similar case of bleeding in a case of hanging leading to the suspicion of murder has been reported by Sharma LK.[28]

Tsokos M in his paper discusses in detail about the various artefacts occurring during the early Post-Mortem interval and their significance in concluding the cause of death and time since death.[29]

Third party artefacts:

Insect / animal activity (Anthrapophagy)

1. Rodents gnaw away soft tissues of body especially ear, nose, lips etc. They produce shallow craters with irregular border nibbling with leave long grooves and lacks vital reaction.
2. Insect's marks (ants, roaches etc.) resemble abrasion. These marks are dry, brown with irregular margins and are usually seen in moist areas of body such as groin, scrotum, anus, armpits etc.
3. Bodies recovered from water may show gnawing injuries by aquatic animals. Flies or maggots may alter the appearance of wound.[4]
4. Cat bites may sometimes resemble knife wounds.
5. The bites by dogs are clear-cut, with deep impression of teeth in small area.
6. Rarely injuries by crab may simulate stab wounds.
7. Any animal attacking the dead body will select the areas of broken skin. Thus Ante-Mortem injuries are greatly affected.[2]
8. Maggots may alter the shape of the wound.[4]
9. Wounds by the maggots may look like bullet wounds.[2]

In the study done at Kurnool[18], the artefacts due to animal and insect activity accounted for 13 cases (15%), out of the total 74 artefacts. Artefact due to ant-bite marks were the most common feature. In bodies retrieved from water or aquatic environments loss of soft tissues due to the aquatic organism bites was seen. Rodent activity resulted in loss of tissue mainly over the face

leaving characteristic teeth marks and also nibbling activity over the fingers and toes without any bleeding were seen.

Similarly in Karachi[26], animal and insects producing artefacts were documented in 45 cases out of 229 Post-Mortem artefacts.

In his case report, HS Thejaswi reported 3 cases of artefacts due to anthropophagy – 2 cases of bleeding in hanging, where the source of bleeding was from Post-Mortem ant abrasions in the groin, trunk and auditory canal and another case of drowning where there was a Post-Mortem injury over neck due to fish bite.[5]

Similar cases of Post-Mortem bites by fish, shark and other aquatic organisms were reported by Vanin[30], Mottonen M[31], Ihama Y[32] and Hugland WD[33].

Gaurav Sharma[27] and C.P. Campobasso[34] discusses about the importance of Post-Mortem ant abrasions and their subsequent Post-Mortem bleeding.

There is documentation of a rare species of insect *Notiothauma reedi,* causing the artefact formation in forest regions of Chile.[35]

Mathur PN[36] and Tyagi A[37] have reported cases of cadaver damage caused by dog bite and their complication in identifying the actual cause of death. Rossi ML[38] reported about the artefacts caused by indoor pets. Romain

N[39] and Tosokos M[40] have reported regarding the highly mutilating injuries and castration respectively, caused by dog bites.

Case reports of multiple Post-Mortem animal bites from a variety of carnivorous and scavenging animals have been documented by Glass RT[41], R.W.Byard[42,43], Alan R. Moritz, K[44], Moraitis[45], Tosokos M[46].

Rodents are omnipresent and several forensic literatures in many countries have documented the damage of dead body by rodent bites leading to false accusation of homicide. Tosokos M[46,47], Patel F[48] and Huglund W. D[49] have studied in detail about the Post-Mortem rodent activity.

Two rare cases of Post-Mortem scavenging of dead bodies by crows have been reported.[50]

Therapeutic / resuscitative artefacts

The work of doing autopsy may sometimes become difficult in cases where the victim has sustained severe injuries and has survived for a long time, undergoing surgical and other treatment, likely to affect the interpretation of findings at the time of conducting autopsy, if the autopsy surgeon is not conversant with their origin and significance. This focuses the necessity of going through all the records of the Ante-Mortem treatment and if need be, a discussion with the doctors who attended the victim during hospitalisation.[3,12]

The following are a few examples:

1. External cardiac massage may be associated with fracture of the ribs and rarely fracture of sternum. These fractures may lead to lung contusion or anterior mediastinal and pericardial contusions[3,12] and very remotely cause lacerations of liver and upper abdominal organs.[13] These rib fractures are usually identified by their symmetrical, parasternal pattern and the relative lack of haemorrhage, which indicates their peri-mortem or post-mortem origin.[6]
2. Resuscitation procedure performed immediately after death may cause pneumothorax as an artefact.
3. Use of defibrillator may leave impression over chest that may be confused with contusion.
4. Intra-cardiac injection given terminally may result in bruised heart and Hemopericardium.
5. Investigative procedure like central venous line etc. may result in extravasation of blood in neck muscles that may be confused with strangulation mark over neck.
6. Damage to mouth/lips/teeth/palate/pharynx/larynx may occur from attempts to introduce a laryngoscope.
7. Mouth-to-mouth breathing may result in injury to face, neck, lips, gums and that has to be differentiated from smothering.
8. Endotracheal intubation, positive pressure ventilation or artificial respiration may cause surgical emphysema and Pneumothorax.[4]

9. Automated pneumatic cuff used for blood pressure monitoring placed around upper arm can cause petechial ecchymoses, compartment syndrome from an intramuscular haematoma.[3]
10. Administration of fluids or multiple blood transfusions may introduce changes in the blood alcohol concentration or concentrations of other toxic agents.
11. Shape and size of the injury/injuries may be altered by the surgical intervention. The appearance of entrance and/or exit wounds may be distorted by surgical interference or during washing/cleaning the wounds. Bullet or pellet(s) may drop out unnoticed while removing clothing in the Emergency Wing. Similarly, it may happen in the operating rooms too.[12]
12. Esophageal intubation may produce gastric dilatation.
13. A cervical collar impression may mimic a ligature furrow.
14. After death the extremities may be bound to facilitate transportation which can look like abrasions.
15. Medical tape after removal can abrade the skin.[2]
16. With passage of time, the wound heals, become septic and other toxic substances are metabolized and excreted and anatomic artefacts are frequently introduced by therapeutic measures.[13]
17. Drainage wounds may be mistaken for firearm wounds.
18. Sometimes, a bullet may be found encapsulated inside the body, while the actual cause of death may be something else.[2]

In a study conducted at Istanbul, "Resuscitation Artefacts in Forensic Autopsies", resuscitation artefacts were studied in detail; the location and the features of the lesions, the problems arising from them were analyzed and discussed. 11.7%(n:51) of resuscitated cases had multiple rib or sternum fractures with or without bruising and 4.2%(n:19) had only bruise. Sternum fractures were found, with or without bruising in 3.9%(n:17) of resuscitated cases.[51]

In the study done by Mirz FH, fracture of ribs were noted in 8 medico-legal autopsies due to aggressive resuscitation measures carried out prior to death.[26]

In the study of T. Sai Sudheer, therapeutic and resuscitation artefacts accounted for 12% that included multiple injection marks over the precordial region, defibrillator marks simulating ring like contusions, extravasations of blood in the soft tissues of chest due to external cardiac massage and in one case fracture of the left side ribs over pre-cardiac area with minimal contusions at fracture sites were noted. Presence of lubricant Xylocaine jelly for the passage of urinary catheter can be misinterpreted as seminal leak in female genital tract. Contusion caused by oxygen mask applied with force may mimic like smothering. Out of the total 15 cases, 7 were therapeutic artefacts and 8 were resuscitation artefacts.[18]

Raven KP[52], Fitchet A.[53], Odom A[54], Krischer JP[55], Baubin M[56] have all discussed about various types of perimortem injuries occurring during

vigorous cardio-pulmonary resuscitation. Raven KP discusses the injuries of larynx in intubation while Fitchet A. describes splenic trauma during resuscitative measures. Odom A describes the prevalence of retinal haemorrhages in paediatric patients who received CPR. Krischer JP and Baubin M reported the complications of CPR including thoracic injuries.

Yadav A[57] reported a case of Post-Mortem artefact due to cervical collar, which was used for the purpose of cervical vertebral fracture / dislocation in a case of delayed hanging death.

Machii M, et al.in his paper described a rare artefact of cardiac rupture due to penetrative injury by fractured sternum as a result of rigorous Cardio-Pulmonary Resuscitation.[58]

Darok M[59], Leadbeatter S[60], Hüseyin Eş[61] and Hart AP[62] have all studied about resuscitation injuries in detail. Hüseyin Eş described about a rare case of resuscitative artefact confirmed by Post-Mortem angiography at autopsy.

Deliberate mutilation / dismemberment

1. A cadaver possesses difficulties for disposal due to its size, so mutilation or dismemberment may be attempted by criminals.
2. Sometimes, criminal may inflict injuries after death to mislead the investigations.

Often a person may be killed and thrown in water or set or fire. Gaurav Sharma, in his study has described a case of such Post-Mortem burns wherein lack of carboxy hemoglobin in blood and soot in windpipe aroused the suspicion.[27]

Embalming artefacts

1. The embalmer may pass a trocar in any of the existing stab/ firearm wound, there by altering the appearance and the track or may make a fresh wound for injecting embalming fluid which may likely be confused for stab wounds and produce false tracks.[2]
2. Embalming provides chemical stiffening similar to rigor mortis, so difficulty may arise in estimating time since death.
3. Embalming destroys cyanide, alcohol, opiates, carbon monoxide thus toxicological analysis becomes useless or difficult.[4]
4. The skin may become transparent and minor hemorrhages become visible.
5. Blood will clot and produce multiple clots within the pulmonary vasculature.[2]
6. Embalming button used to seal embalming hole may resemble gunshot entry wound.
7. Blood grouping cannot be done.[1]

Environmental artefacts:

Effects of heat

1. In burn cases, the subcutaneous fat becomes hard and ruptures.
2. The ruptures may simulate an incised or lacerated wound.
3. Heat hematomas may simulate extradural hematoma.[4]
4. An unburnt groove around neck due to clothing may resemble strangulation mark.
5. In severely burnt bodies, fat droplets in pulmonary vessels may be mistaken for Ante-Mortem fat embolism.
6. Radiant heat reaching body after death may cause loosening, drying or tanning of skin.[2]
7. Heat applied to skin of a dead body may produce a Post-Mortem blister. It will contain air or non-albuminous fluid without chlorides and no line of hyperemia.[13]
8. Heat fracture may look like traumatic fractures.[1]

A case of Post-Mortem heat fracture of skull is reported by Gaurav Sharma, which was simulating Ante-Mortem injury.[27]

T Sai Sudheer[18] identified 8 cases of Post-Mortem artefacts due to burns, as the third most common artefact next to decomposition and breakage of rigor mortis, contributing to 16% of total artefacts in his study. In his study, post-mortem heat ruptures which were of considerable length up to several inches and were superficial were noted in view of the possibility to dispose of

the body by fire. In victim of wounds, special care was taken in the interpretation of these changes which simulate lacerated wounds. Heat ruptures were commonly noted. Heat fractures and charring of the outer table of the skull were encountered in some cases. Heat hematoma was not encountered in any. [18]

Akhilesh Pathak reported a case of Post-Mortem burns due to fire from an incense stick placed near the dead body prior to autopsy.[63]

Post-Mortem corrosion

1. Artificial abrasions or burns may be produced by the spillage of gasoline/ acid/ alkali on a dead body, causing detachment of epidermis on drying, has a yellow to brown color, giving the false impression of abrasion or burns, which can be misinterpreted as cause of death.[1]
2. They occur mainly when fire is put out with water.[2]

Post-Mortem maceration[15,27,64]

1. Physical contact of the dead body with water, soil or air may cause marked changes, depending upon the chemical constituents of the environment and duration of contact. The body may be totally skeletonized leaving decalcified and deformed bones.[10,15]

Only one paper of Post-Mortem maceration has been reported by Senanayake in Sri Lanka[65], which describes the Post-Mortem contact maceration, where the dead bodies kept in mortuaries without contact with

water showed patchy areas of early maceration that misguided the interpretation of time since death.

Miscellaneous artefacts:

Refrigeration artefacts

1. Post-Mortem lividity is normally purplish or reddish blue. When body is kept in refrigerator or exposed to cold environment may have pinkish lividity.
2. Post-Mortem refrigeration of infant solidifies the subcutaneous fat and produces a prominent crease at neck. It may resemble strangulation mark.[2,4]
3. Cold stiffness may mimic rigor mortis.[2]

Mishandling of the body/ transportation artefacts[12]

1. Post-Mortem collection of blood in the occipital region is due to bumping of head.
2. Protruding areas of the body may get abraded due to dragging of the body.
3. Rigor mortis may be broken during lifting or handling of the bodies giving wrong clues towards time since death.[15]
4. Rarely, fractures of the long bones may be caused particularly in debilitated, elderly dead bodies with osteoporotic changes.

5. During transportation, dead body may be contaminated with dirt, soil, grease, etc. This may give wrong impression about the place of occurrence of death.
6. Tearing of the clothing during transportation may appear to be due to some scuffle during life.
7. Attempt to remove ornaments from the body parts like nose, ears, neck, etc. may cause injury to these parts and may send wrong impressions.[12]
8. Transportation can cause shifting of the unfixed hypostasis.
9. Undertaker's fracture may be seen which is a subluxation of the lower cervical spine due to tearing of the intervertebral disc at about C6-C7.[4,10]

Pawan Mittal reported a case of undertaker's fracture identified at autopsy due to transportation.[66]

S.C.Sarkar reported a case of hanging where identification of the manner of death was difficult due to artefacts of ligature mark around the wrists produced by tying a rope during shifting process.[67]

In the study of Mirza FH, injuries due to rough handling of the body is seen in 40 cases, breakage of rigor and shifting of unfixed Post-Mortem lividity seen in 37 cases. Handling of the body during shifting led to the formation of abrasions over the back. Dislocation of shoulder joint was seen in 3 cases.[26]

In the study by T Sai Sudheer, breakage of rigor during transportation and shifted accounted for 9 cases (19%).[18]

Interment and exhumation artefacts

1. Digging tools may cause accidental injuries or fracture to body in exhumation cases.[4]
2. In bodies which are buried, fungal growth is seen at the body orifices. On removal of the fungus, the color of the underlying skin may resemble bruising.[1]

In a study, 6 cases of exhumation that were exhumed for reconfirmation of cause of death, all suffered fractures due to impact of digging tools, and showed injuries that were not previously recorded.

Due to delay in autopsy

1. Uncal grooving, seen in cerebral edema, may also be seen in normal brain.[2]
2. Regional flattening of cerebral convolutions, seen in those parts that are in contact with the cranium, especially in occipital lobes.[1]
3. The surface of the liver may be stained due to bile.
4. The undersurface of the liver may be stained green due to contact with transverse colon.[2]

Toxicological artefacts

1. Ethyl alcohol may be produced in decomposed body and up to 0.15% of endogenous alcohol levels were recorded and considered as upper limit. Post-Mortem production of alcohol has been attributed to bacterial action., which are usually less than 200 mg%.[2] Presence of such alcohol may be mistaken for alcohol intoxication.[4]
2. Decomposition also increases the concentration of carbon monoxide in the blood up to 19%.
3. Significant amount of cyanide is also produced due to decomposition.
4. In cases of burns, the levels of carbon monoxide, cyanides may be increased.
5. Many substituted phenols are found in decomposing tissues, especially P-hydroxyphenyl derivatives.
6. In buried bodies, arsenic may be imbibed from the surrounding earth.[2]

Artefacts associated with accidental deaths[15]

1. Person on an electric pole may die of electrocution, fall down or run over by train and sustain mechanical injuries.
2. A person sustaining road traffic accident on a high may be run over by multiple vehicles, leaving a totally mutilated body.[15]

Artefacts introduced during autopsy/ Autopsy pathologist induced artefacts:

Air in blood vessels

1. Bubbles of gas can enter the cerebral veins, caused when the skull-cap is removed during autopsy when dura is pulled in saggital line.[6, 66]
2. Similarly air may enter the neck vessels during reflection of skin. These may lead to erroneous diagnosis of air embolism.[2]

Skull fractures

1. Any vigorous sawing or using chisel and hammer may result in extension of the existing fractures or fresh fractures may be caused.[12]

Visceral damage

1. When the neck structures are pulled forcefully or improperly, there may be damage of the neck structures.
2. While abdomen or peritoneum is being cut open, coils of intestines may get involved.
3. Improper pulling apart of the liver may cause tears in the diaphragm and denudation and laceration of the bare area of the liver.[12]
4. Rough handling during removal of brain can cause damage to the mid-brain.[2]

Extravasation of blood

1. While giving incision over neck, the blood may accumulate in neck structures and resemble hemorrhages. These hemorrhages have to be differentiated from Ante-Mortem trauma.[4]
2. During removal of the sternum, damage to the heart or internal mammary vessels may lead to seepage of blood in the pleural or pericardial cavities.[12]
3. Artefactual punctate hemorrhages may be misinterpreted that are found beneath the scalp when it is reflected from pericranium. The vessels passing from the subcutaneous layer of the scalp into pericranium gets damaged, when scalp is reflected, and petechial hemorrhages indistinguishable from Ante-Mortem ones due to asphyxia may be produced.[4]
4. In case of suspected cranial injury, dissection of the head prior to body will cause seepage of blood from the dural venous sinuses resembling an Ante-Mortem subdural hemorrhage.
5. Large blood vessels may be cut, while opening the thoracic and abdominal cavities and considerable amount of blood escape into the cavities.[2]

Fracture of hyoid bone

1. Hyoid bone and thyroid cartilage, particularly in old people, may fracture while separating the neck structures forcefully and may resemble Ante-Mortem fracture[4]

2. The osseous union between segments of hyoid may be unilateral. This can cause unilateral mobility of the greater horn which can mimic hyoid fracture.[2]

Injury to blood vessels

1. While dissecting the neck structures, it toothed dissecting forceps is used, it may damage the intima of the carotid artery which resembles a tear as is seen in a case of strangulation.[2]

Toxicological artefacts

Toxicological artefacts can occur due to faulty collection of sample[68], contamination of sample/ preservative, wrong preservative, faulty preservation.

1. When blood is collected from heart with a long needle, it may be contaminated with stomach contents or regurgitated esophageal contents.[69]
2. If blood is contaminated with pericardial or pleural fluids, false results are obtained as regards alcohol, because significant diffusion of alcohol occurs after death from stomach to pleura and pericardial fluid.
3. Certain anti-coagulants used for blood like heparin, methenamine and EDTA give a positive result for methanol.
4. Collecting viscera using contaminated instruments.[2]
5. Collection of viscera in a single container.
6. Use of contaminated dirty bottles/jars or preservatives may result in wrong conclusions for visceral analysis.[12]

7. Improper storage can lead to faulty toxicological reports.

Prinsloo AI, Gordon I in 1951, after dissection of 51 cases, presented a paper that the Post-Mortem oozing of blood in neck tissues is difficult to differentiate from the Ante-Mortem bruise unless a unique dissection technique is adopted to visualize every structure of the neck.[70] Schrader[71] suggested that neck be drained of blood by removing the brain and the heart before reflecting the skin of the neck.

David J. Williams discussed about the anterior approach to the cervical spine to reduce artefact formation in the neck.[72] Rajs J studied about the usefulness of histological changes in ruling out the Ante-Mortem and Post-Mortem thyroid cartilage injuries.[73]

In his study, T Sai Sudheer documented artefacts due to faulty dissection techniques resulted in 3% of artefacts. These artefacts were mostly due to extravasation of blood in the neck tissues, subluxation of cornua of hyoid bone and injury to thyroid cartilage during removal of neck structures and injuries to visceral organs like lungs, heart and liver by the dissecting knife.[18]

Occupational stigmata:

Large number of occupational stigmas can be seen in the dead body depending upon the job of the deceased. It is the duty of the medical officer to identify them occupational marks and rule out them as Ante-Mortem injuries. For example, presence of grease in hands and clothes suggestive of mechanic

job, presence of linear callosities on the fingers of the left hand indicates violinist, guitarist, paint staibns over the fingers might be seen in painters and artists, *Postural Trauma Callosities* in Namazis over the bony areas of the body which are pressed against the ground during '*namaz'* (prayer), presence of callosities on the toes.[4]

Ritualistic artefacts:

Rarely, the dead body may be taken for burial prior to medico-legal autopsy and ritualistic procedures might have been done which would leave marks over the deceased that may misguide the autopsy surgeon to wrong cause of death. The procedures may vary from place to place, depends on the religious and local customs. Some of these peculiar artefacts include the stuffing of foreign body like clothing, rice, betel leaves in the mouth of the deceased, staining the body and face with vermillon and other dyes, washing the body prior to rituals, thereby removing some vital evidences.

In a case of Post-Mortem burns, the source for fire was from an incense stick placed near the dead body as a ritualistic practice to ward off the bad odour.[63]

METHODS AND MATERIALS:

Study group **:** All cases of deaths requested for autopsy in Govt. Kilpauk Medical College, Chennai-10.

Study design **:** Descriptive, Observational, Cross-Sectional study.

Place of study **:** Government Kilpauk Medical College & Hospital.

Duration of study **:** 12 months.

MATERIALS:

i. Police History.

ii. Photographs taken by police at the scene of crime.

iii. Medical/Treatment Records.

iv. Autopsy Findings & photographs taken at autopsy.

v. Chemical analysis report.

vi. Histopathological report.

INCLUSION CRITERIA:

Every 8th case of death requested for autopsy in Govt. Kilpauk Medical College & Chennai- 10 from January 2017 to December 2017.

EXCLUSION CRITERIA:

- Skeletonised bodies.
- Exhumed bodies.

DATA COLLECTION:

The inquest forms and the history of the case brought by the police for the conduction of Post-Mortem examination will be studied carefully for various details such as history furnished, injuries, circumstances of death and where ever it was felt necessary enquiries will be made with the investigating officers, emphasizing on the time and date of death being reported to them, place of retrieval of the body, example: water medium, open field, closed rooms etc, whether medical treatment was instituted prior to death, mode of transport, whether body was preserved in cold storage or not.

In addition, special care will be taken in cases where various features/ injuries on the body due to assault, accidents, burns cases, decomposition and animal activity which were labeled either as ante mortem in nature or Post-Mortem, under various sections namely 174 Cr. P. C., 201- I.P.C., 302 -I.P.C., 304[A] -I.P.C. etc.

The nature of the injuries or features whether Ante-Mortem or Post-Mortem will be determined by examination with a hand lens, the characteristics of the injuries will be studied carefully with reference to the presence or absence of vital reactions, wound edges, the site of the injuries, the overall state of the body and also by ascertaining the cause and mode of death, chemical analysis report and histopathology report.

Where ever necessary, in addition to the photographs taken by the police, photographs of interesting cases with respect to the study will be taken and all the artefacts will be grouped under different categories and analyzed, ultimately.

Owing to the high load of cases and to prevent loss of significance of the results and to avoid selection bias simple randomization is followed wherein every 8^{th} case requested for post-mortem examination in the Department of Forensic Medicine & Toxicology from January 2017 to December 2017 is taken into study. Out of the total 2866 cases that came for autopsy 358 cases were selected by simple randomization and were studied for the presence of any type of artefact which would influence the conclusion of cause of death or any ante-mortem finding present in the dead body.

The details of the deceased like age, sex, occupation and detailed history of the case pertaining to time, place and month of death, type of death, identity of the body, treatment details and condition of the body are noted in a proforma, along with the presence or absence of any kind of artifact. In case of presence of multiple artefacts in a single body, the best suited artifact for the study is selected. After confirming the presence of artifact, the case is taken into the study for analysis. If the artifact is not confirmed or absent, the case is discarded from the study.

OBSERVATION & RESULTS

Table 1: Total No. of cases with artefacts

Total no. of cases	Total No. of cases	Percentage
Positive for artefacts	122	34.0%
Negative for artefacts	236	66.0%
No. of cases studied	358	100%

In our study, a total of 358 cases were studied for the presence of artefacts. Out of the 358 cases, presence of artefacts was confirmed in 122 cases which accounted for 34% of the total cases studied. 236 cases did not show any of the artefacts during autopsy.

Fig. 1: Total no. of cases with artefacts

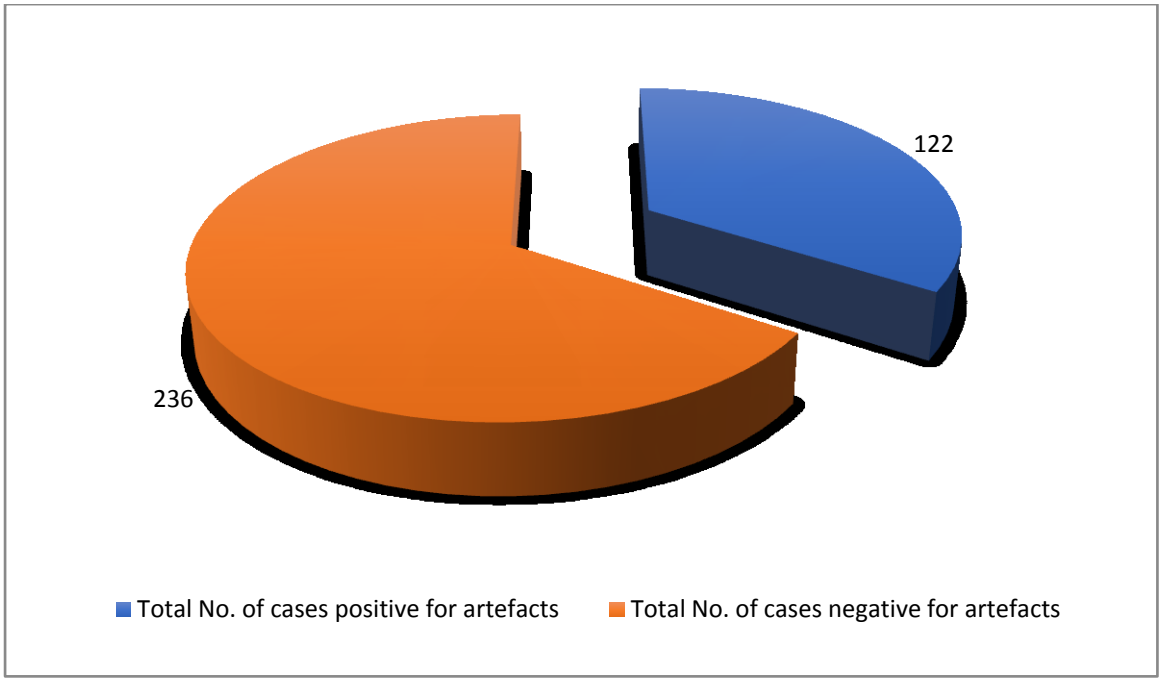


Table 2: Age-wise distribution of cases with artefacts

Age group	Total No. of cases with artefacts	Percentage
Birth-10	2	1.6%
11-20	8	6.6%
21-30	19	15.6%
31-40	17	13.9%
41-50	28	22.9%
51-60	25	20.4%
61-70	17	13.9%
71-80	5	4.0%
81-90	1	0.8%
Total	122	100%

Maximum number of artefacts was noted in 41-50 years age group (22.9%) in comparison to the least number of cases in extremities of life with 1.6% from birth till 10 years and 0.8% from 81-90 years.

Fig. 2: Age-wise distribution of cases with artefacts

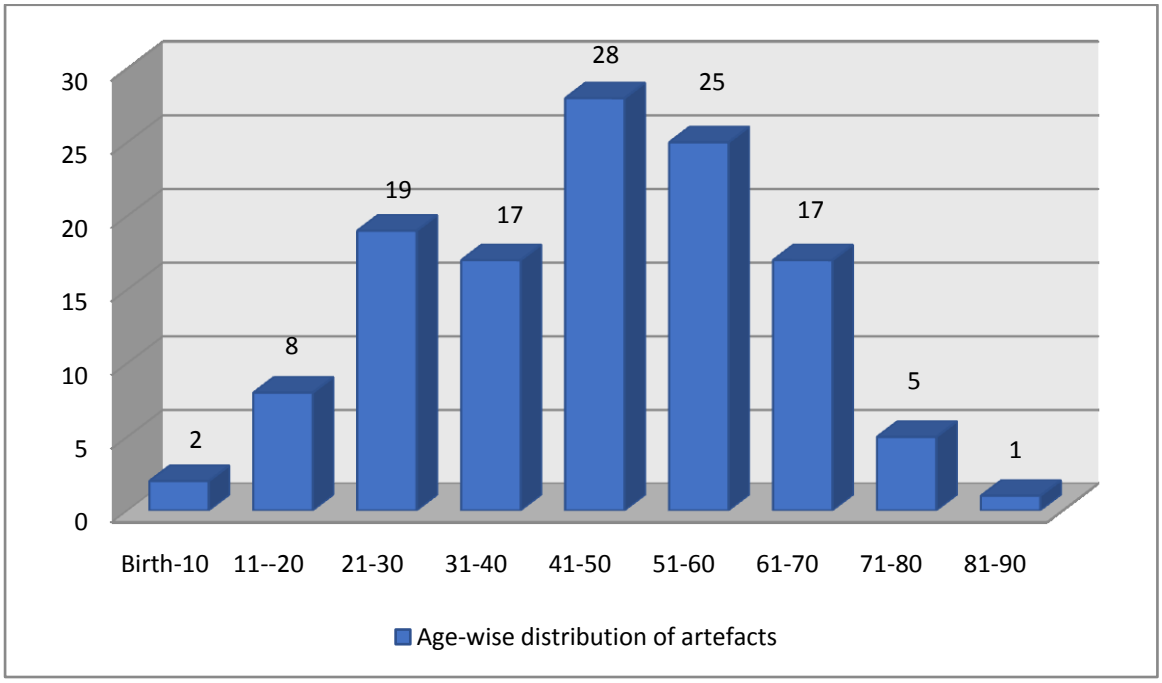


Table 3.1: Sex-wise distribution of cases with artefacts

Sex of the deceased	Total No. of cases with artefacts	Percentage
Male	94	77.0%
Female	28	23.0%
Total	122	100%

Among the 122 cases with artefacts, 94 cases were male (77.0%) and 28 cases were female (23.0%). No cases of transgender or third sex have been studied.

Fig. 3.1: Sex-wise distribution of cases with artefacts

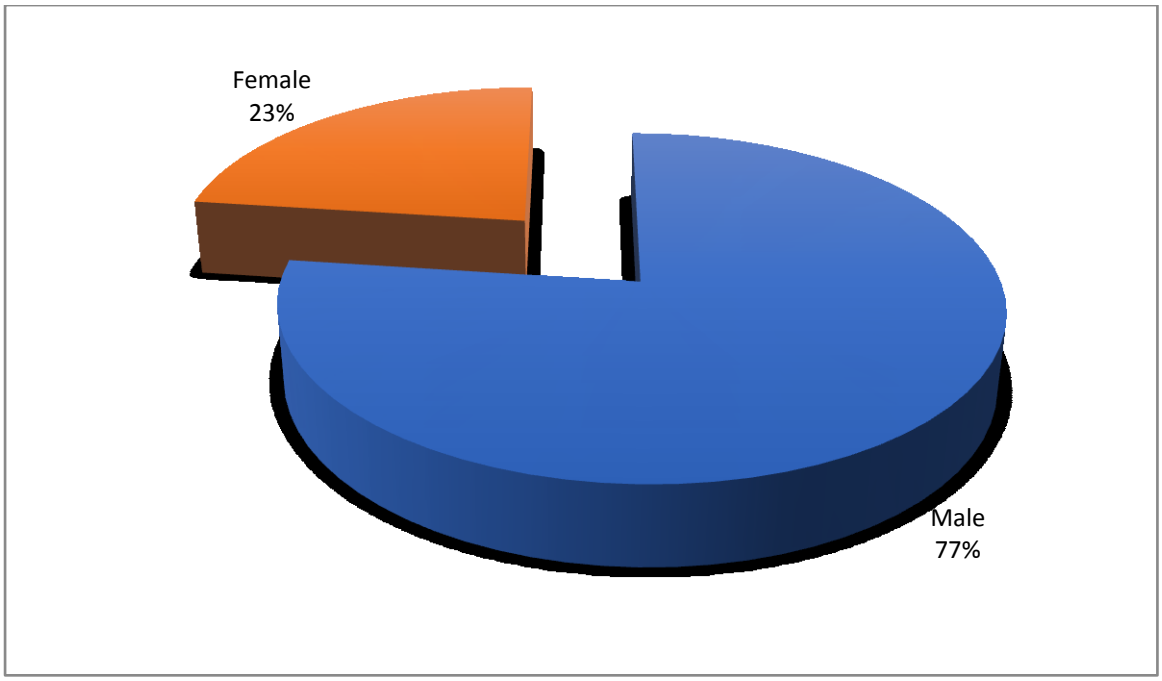


Table 3.2: Percentage of artefacts in each sex

	Male	Female	Total
Presence of artefact	94 (39.0%)	28 (23.9%)	122
Absence of artefacts	147 (61.0%)	89 (76.1%)	236
Total	241 (100%)	117 (100%)	358

Out of the 241 males studied, artefacts were present in 94 cases (39.0%). Out of the 117 female cases studied, artefacts were noted in 28 cases (23.9%). The percentage of artefacts in male dead bodies was higher than the percentage of artefacts in female bodies.

Table 3.2: Percentage of artefacts in each sex

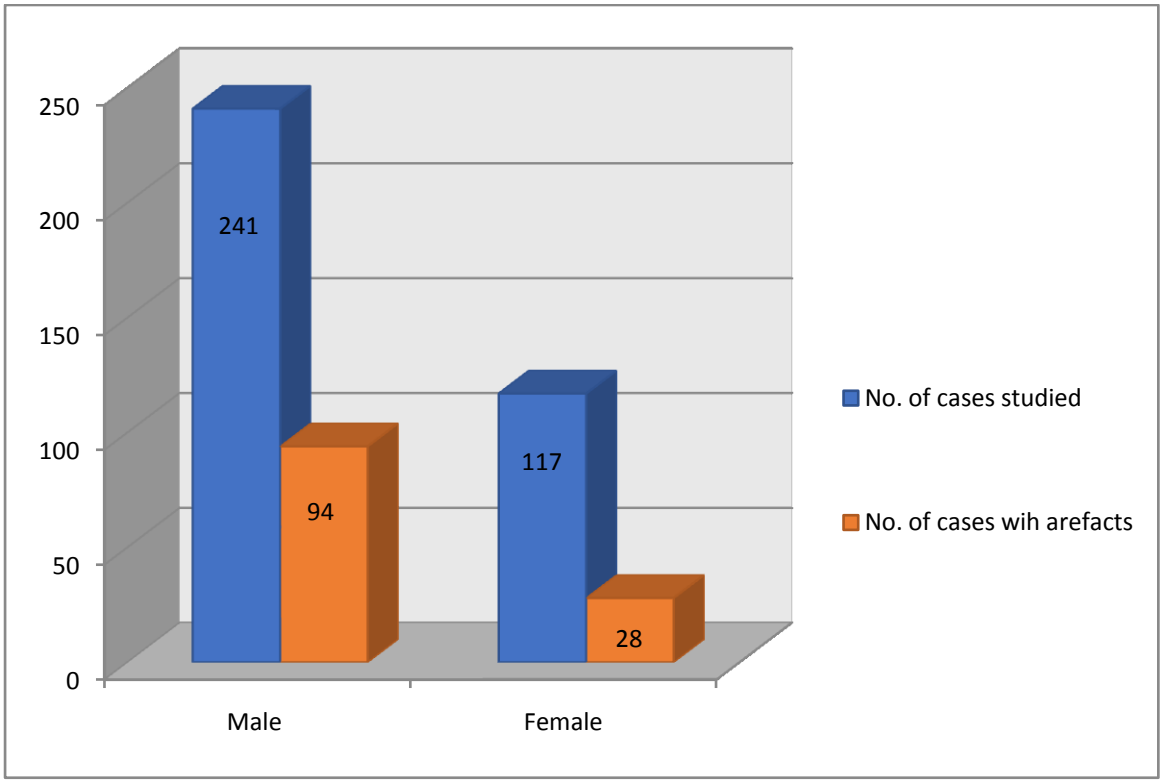


Table 4: Month-wise distribution of cases with artefacts

Month of Post-Mortem examination	Total No. of cases studied	Total No. of cases with artefacts	Percentage
January	27	13 (48.1%)	10.6%
February	29	8 (27.5%)	6.6%
March	29	12 (41.3%)	9.8%
April	28	11 (39.2%)	9.0%
May	33	12 (36.3%)	9.8%
June	31	15 (48.3%)	12.2%
July	36	13 (36.1%)	10.6%
August	27	11 (40.7%)	9.0%
September	31	6 (19.3%)	4.9%
October	30	8 (26.6%)	6.6%
November	26	7 (26.9%)	5.8%
December	31	6 (19.3%)	4.9%
Total	358	122	100%

The 358 cases were studied all around the year and maximum number of cases with artefacts were seen in the month of June with 15 cases (12.2%) followed by July and January with 13 cases (10.6%), whereas least number of cases were in September and December with 6 cases (4.9%).

The relation of each month to the presence of artefacts in the dead body is analysed by the percentage of cases with artefacts out of the total number of cases studied in the month, which is more in the month of June (48.3%) with 15 cases out of 31, followed by January (48.1%) with 13 cases out of 27, while the least percentage is seen in the months of September and December (19.3%) with 6 cases out of 31 each.

Fig. 4: Month-wise distribution of cases with artefacts

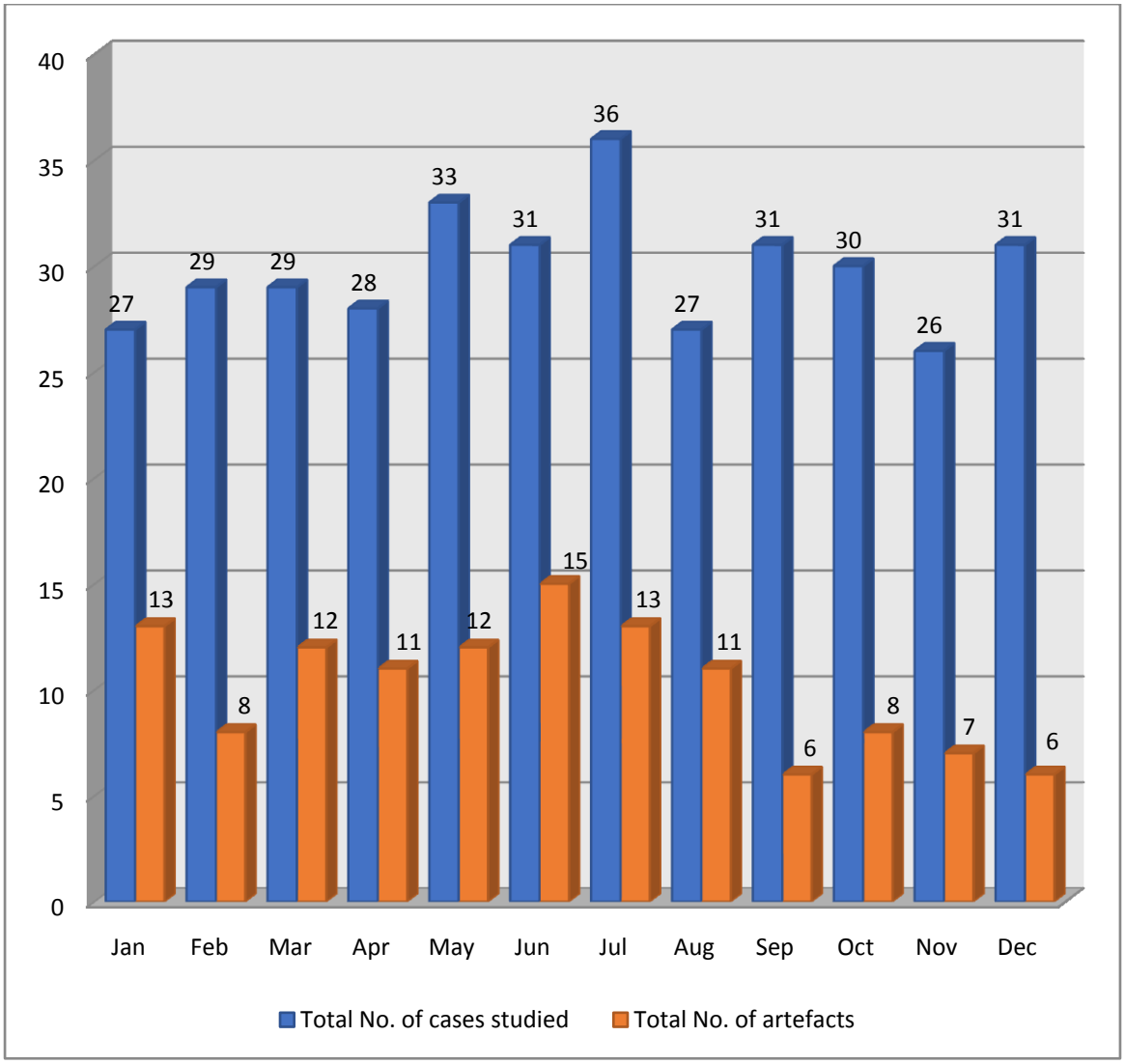


Table 5: Seasonal distribution of case with artefacts

Season	Total No. of cases with artefacts	Percentage
Winter	21	17.2%
Summer	35	28.6%
Summer monsoon	45	36.8%
Post monsoon	21	17.2%
Total	122	100%

Maximum number of artefacts were recorded in the season of summer monsoon with 45 cases (36.8%), followed by summer (28.6%). Winter and post monsoon each had 21 cases of artefacts (17.2%).

Fig. 5: Seasonal distribution of case with artefacts

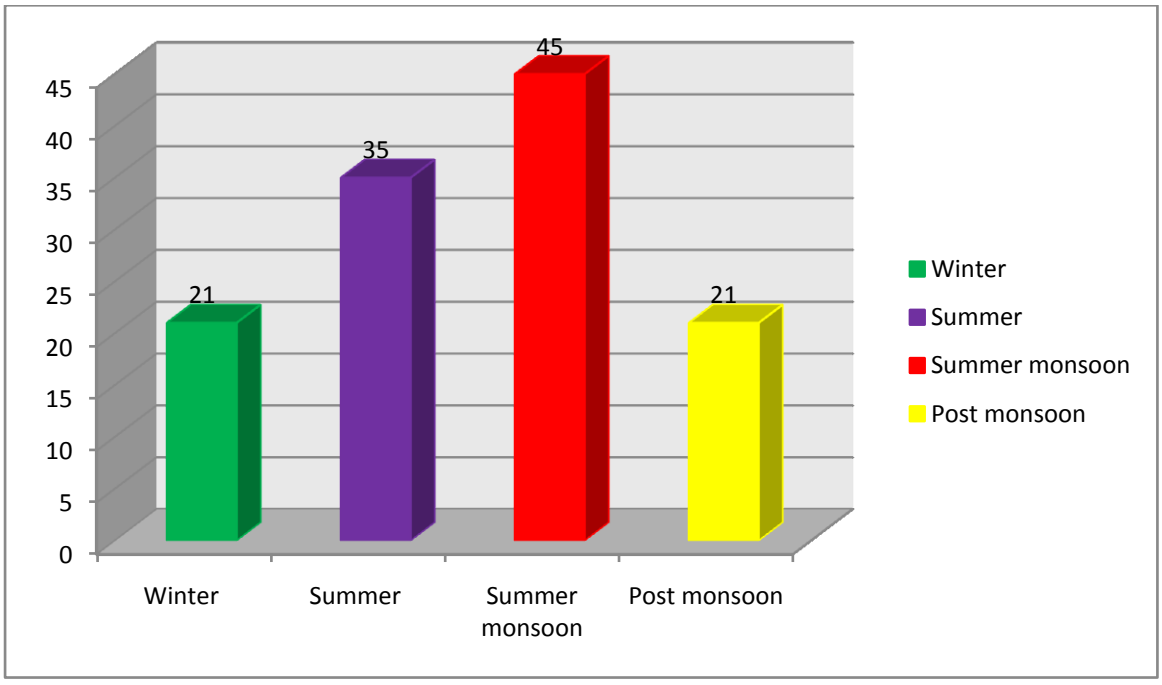


Table 6: Distribution of artefacts based on the history of the case

History of the case	Total No. of cases with artefacts	Percentage
Assault	1	0.8%
Snake strike	1	0.8%
Suspicious death	3	2.4%
Sudden death	47	38.5%
Poisoning	5	4.0%
Burns	18	14.7%
Hanging	11	9.0%
Fall from height	6	4.9%
Train traffic accident	10	8.1%
Drowning	4	3.2%
Road traffic accident	14	11.4%
Electrocution	2	1.6%
Total	122	100%

Maximum number of artefacts were noted in sudden death cases (38.5%) while least number were seen in assault and snake strike cases (0.8% each).

Fig. 6: Distribution of artefacts based on the history of the case

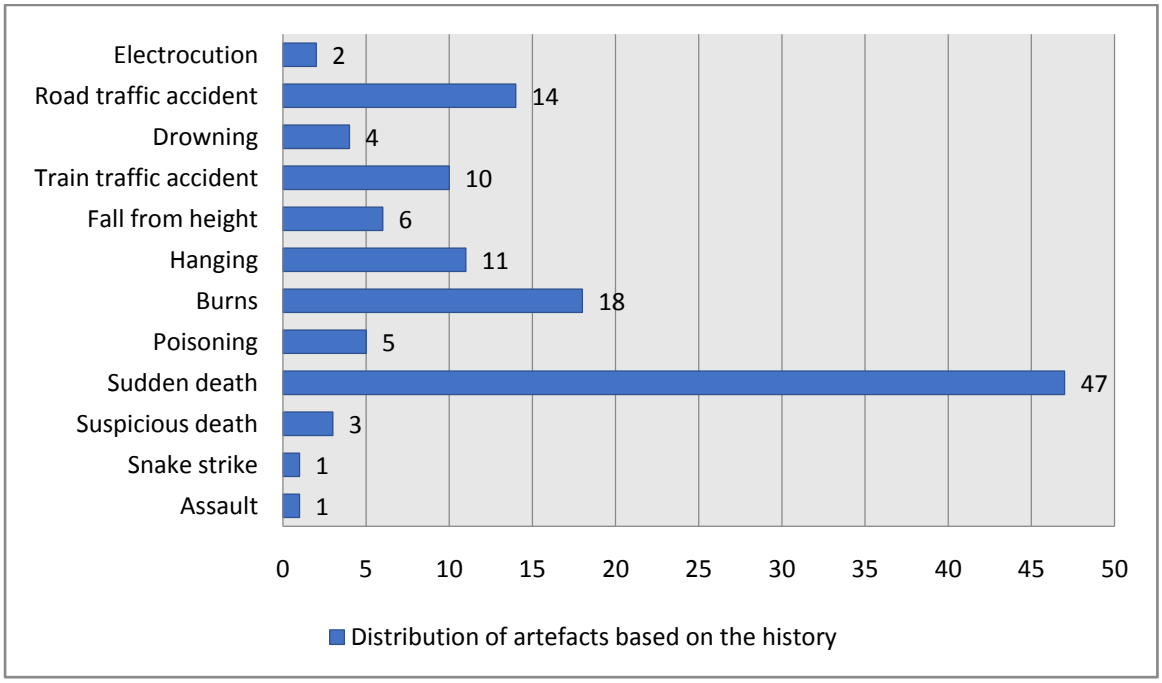


Table 7: Distribution of cases with artefacts in relation to time of death

Time of death	Total No. of cases with artefacts	Percentage
Morning (6.01 am- 12 noon)	29	24.0%
Afternoon (12.01 pm- 6 pm)	18	15.0%
Evening (6.01 pm- 12 am)	33	27.0%
Night (12.01 am- 6 am)	20	16.0%
Not known	22	18.0%
Total	122	100%

Most of the artefacts were found in the bodies that died in the evening time from 6.01 pm to 12 midnight (27.0%) while only 18 cases that died in the afternoon showed artefacts (15.0%).

Fig. 7: Distribution of cases with artefacts in relation to time of death

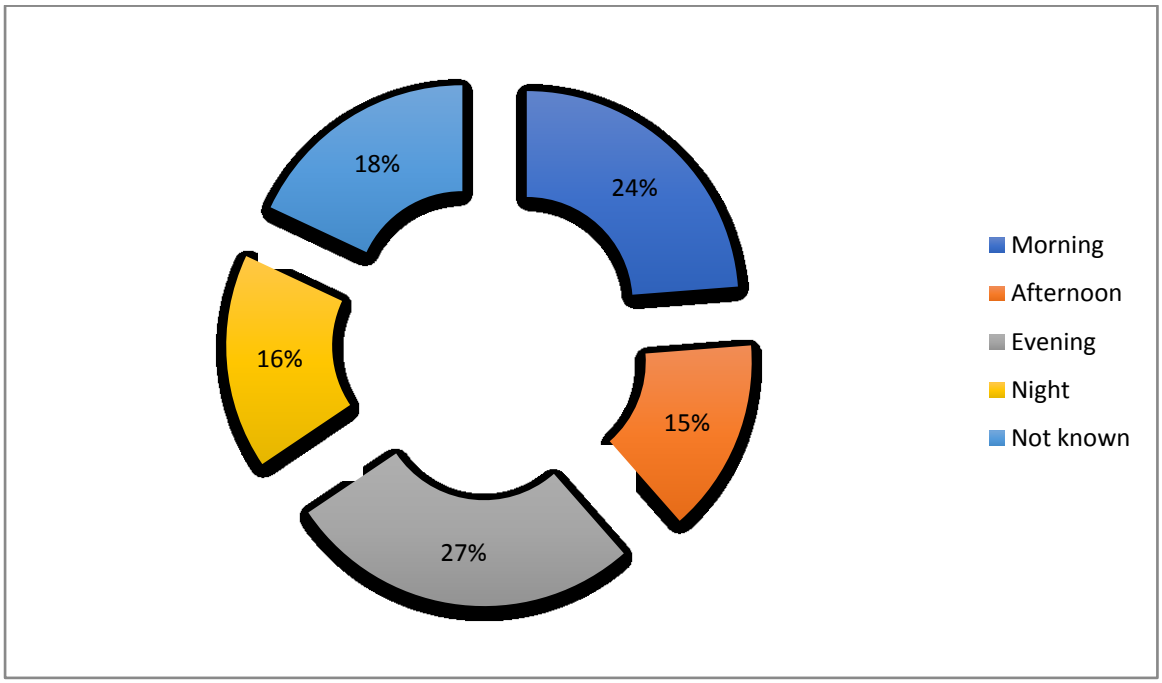


Table 8: Distribution of cases with artefacts in relation to Post-Mortem Interval

Post-Mortem Interval	Total No. of cases with artefacts	Percentage
Up to 6 hours	16	13.1%
6-12 hours	24	19.6%
12-24 hours	24	19.6%
24-36 hours	19	15.5%
>36 hours	39	31.9%
Total	122	100%

Artefacts were more in those bodies with long post-mortem interval of more than 36 hours (31.9%) while those bodies that were autopsied within 6 hours of death showed least number of artefacts (13.1%)

Fig. 8: Distribution of cases with artefacts in relation to Post-Mortem Interval

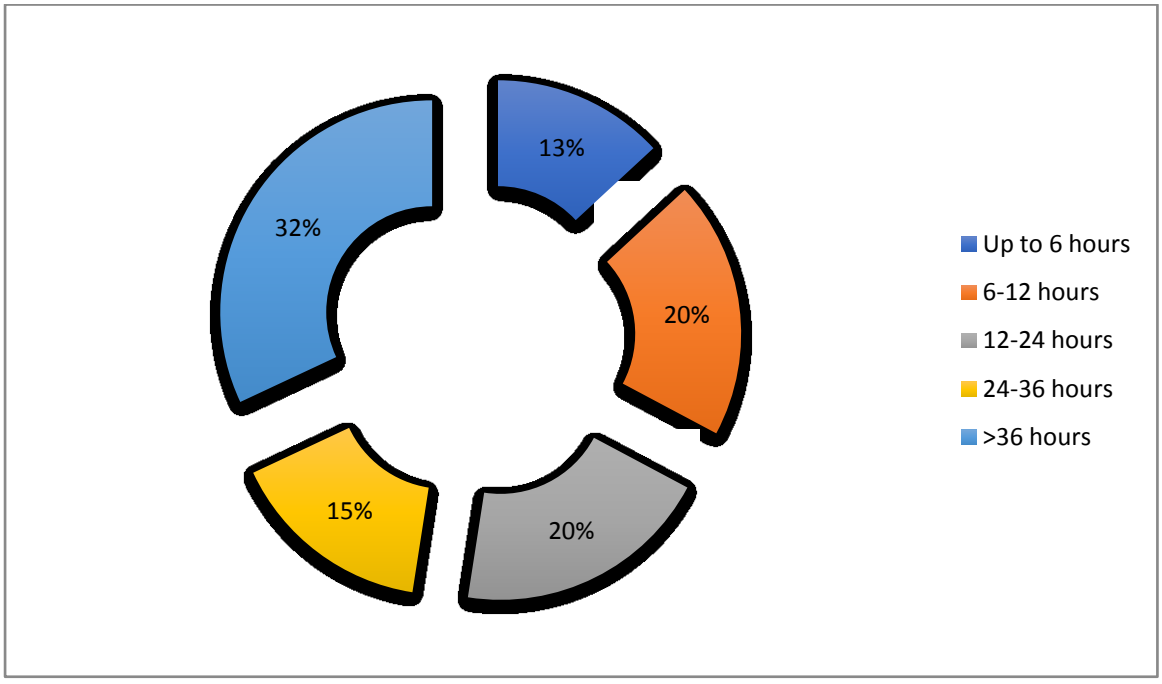


Table 9: Distribution of cases with artefacts in relation to the place of retrieval of body

Place of retrieval of body	Total No. of cases with artefacts	Percentage
Inside home	25	21.0%
Outside home	31	25.0%
Roadside	39	32.0%
Bushes	3	2.5%
Water	4	3.5%
Hospital	20	16.0%
Total	122	100%

Among the 122 cases of artefacts studied, maximum number of bodies was retrieved from roadside (32.0%), followed by outside home (25.0%). Only 3 cases were retrieved from bushes (2.5%), which was the lowest.

Fig. 9: Distribution of cases with artefacts in relation to the place of retrieval of body

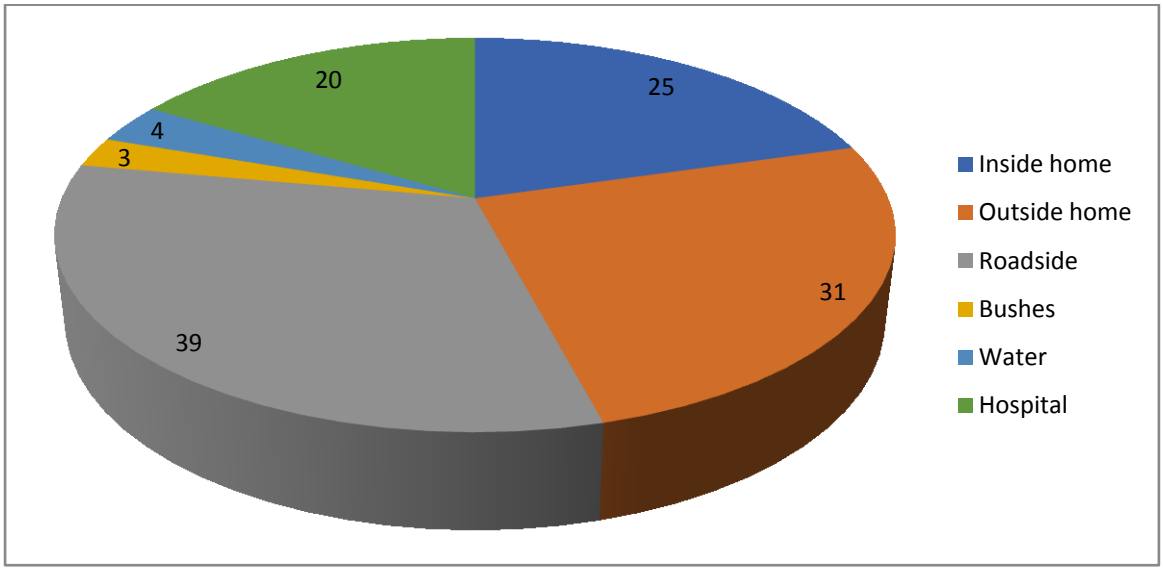


Table 10: Distribution of cases with artefacts in relation to the identity of the body

Identity of the body	Total No. of cases with artefacts	Percentage
Unknown cases	33	27.0%
Known cases	89	73.0%
Total	122	100%

Artefacts were noted in 33 cases of unknown dead bodies (27.0%) and 89 cases of known dead bodies (73.0%)

Fig. 10: Distribution of cases with artefacts in relation to the identity of the body

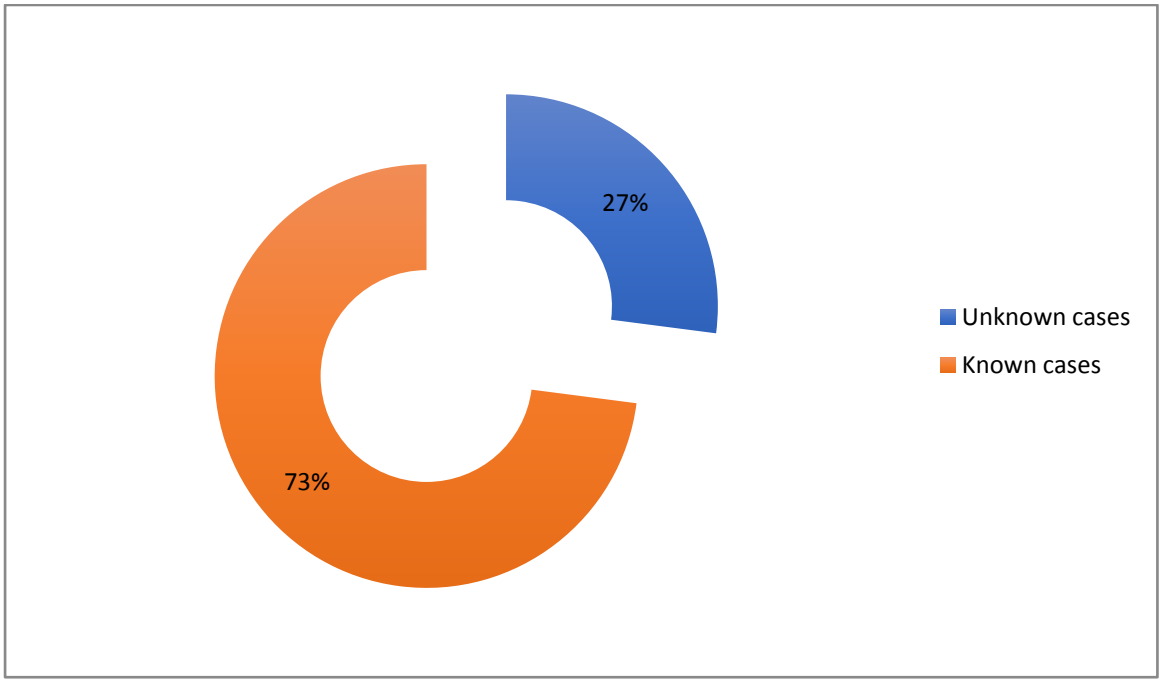


Table 11: Distribution of cases with artefacts in relation to the treatment status of the deceased

Treatment status of the deceased	Total No. of cases with artefacts	Percentage
Treated	21	17.0%
Brought dead to the hospital	101	83.0%
Total	122	100%

Out of the 122 cases with artefacts, 21 were treated cases (17.0%) and in-hospital deaths while 101 cases (83.0%) were brought dead to the hospital.

Fig. 11: Distribution of cases with artefacts in relation to the treatment status of the deceased

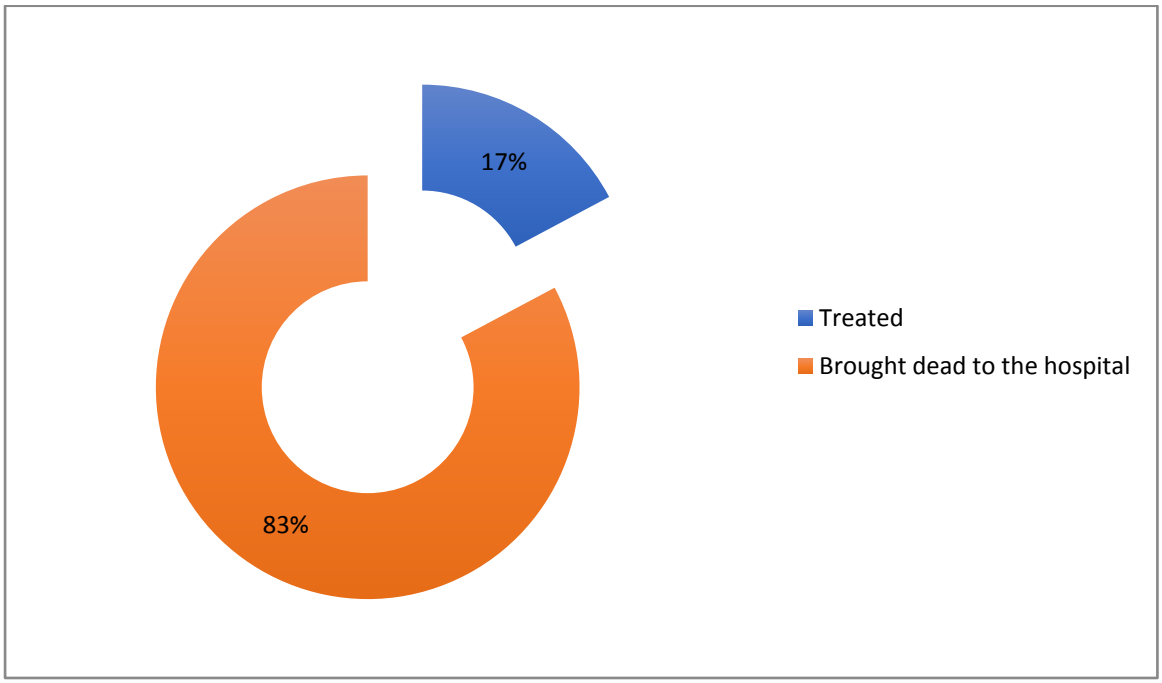


Table 12: Distribution of cases with artefacts in relation to the condition of the body

Condition of the body	Total No. of cases with artefacts	Percentage
Decomposed	46	38.0%
Not decomposed	76	62.0%
Total	122	100%

46 bodies of the 122cases with artefacts were decomposed (38.0%), while the remaining 76 bodies were not decomposed (62.0%).

Fig. 12: Distribution of cases with artefacts in relation to the condition of the body

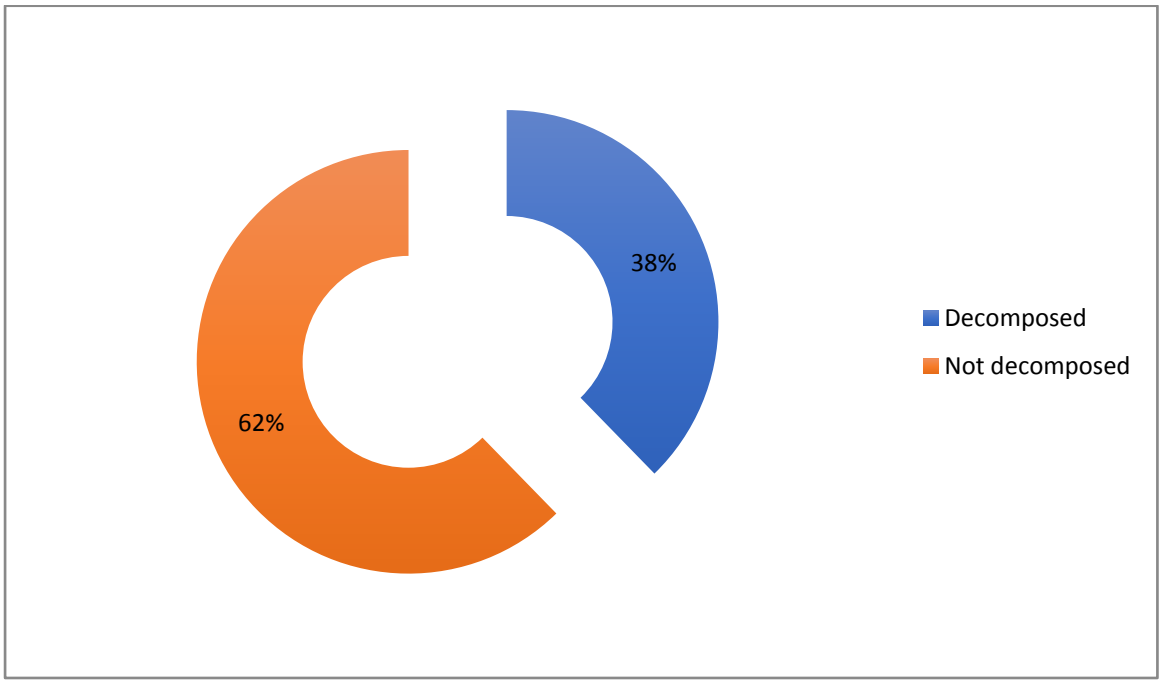


Table 13: Distribution of type of Post-Mortem artefacts

Type of Post-Mortem artifact	No. of cases with artefacts	Percentage
Artefacts after death & before autopsy	102	83.7%
Artefacts during autopsy	20	16.3%
Total	122	100%

Artefacts are classified into two major types as those introduced after death and before autopsy and those introduced during autopsy. Among the 122 cases positive for artefacts, artefacts were introduced before autopsy in 102 cases (83.7%), while in 20 cases it was introduced during autopsy(16.3%).

Fig. 13: Distribution of type of Post-Mortem artefacts

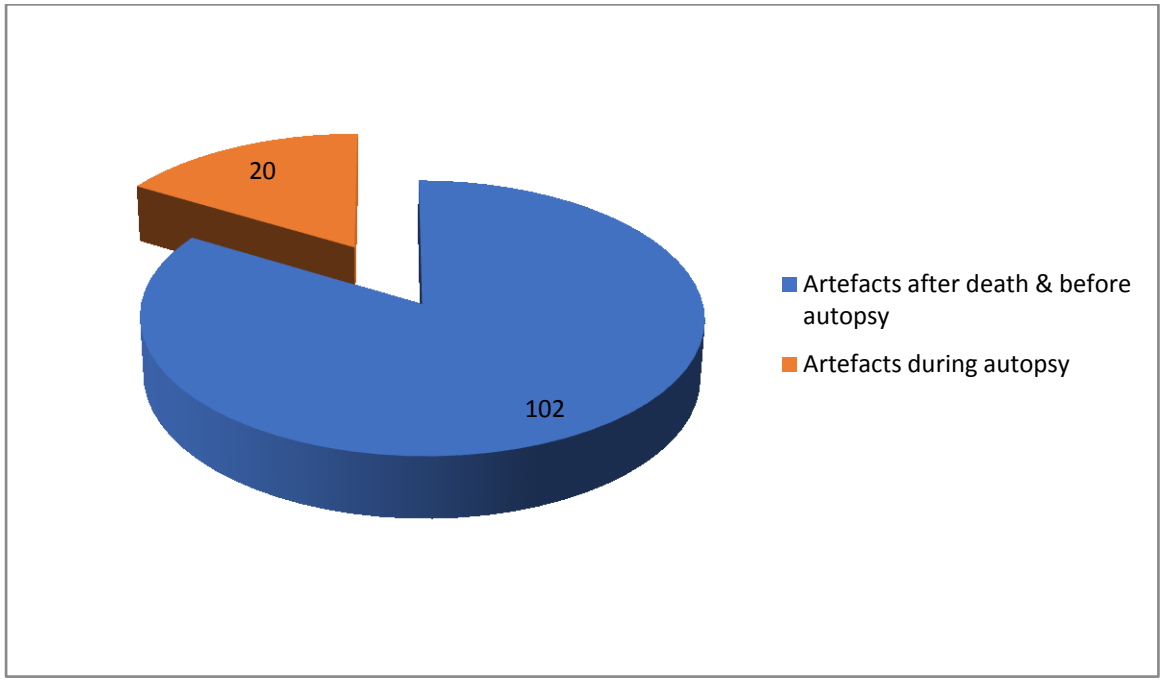
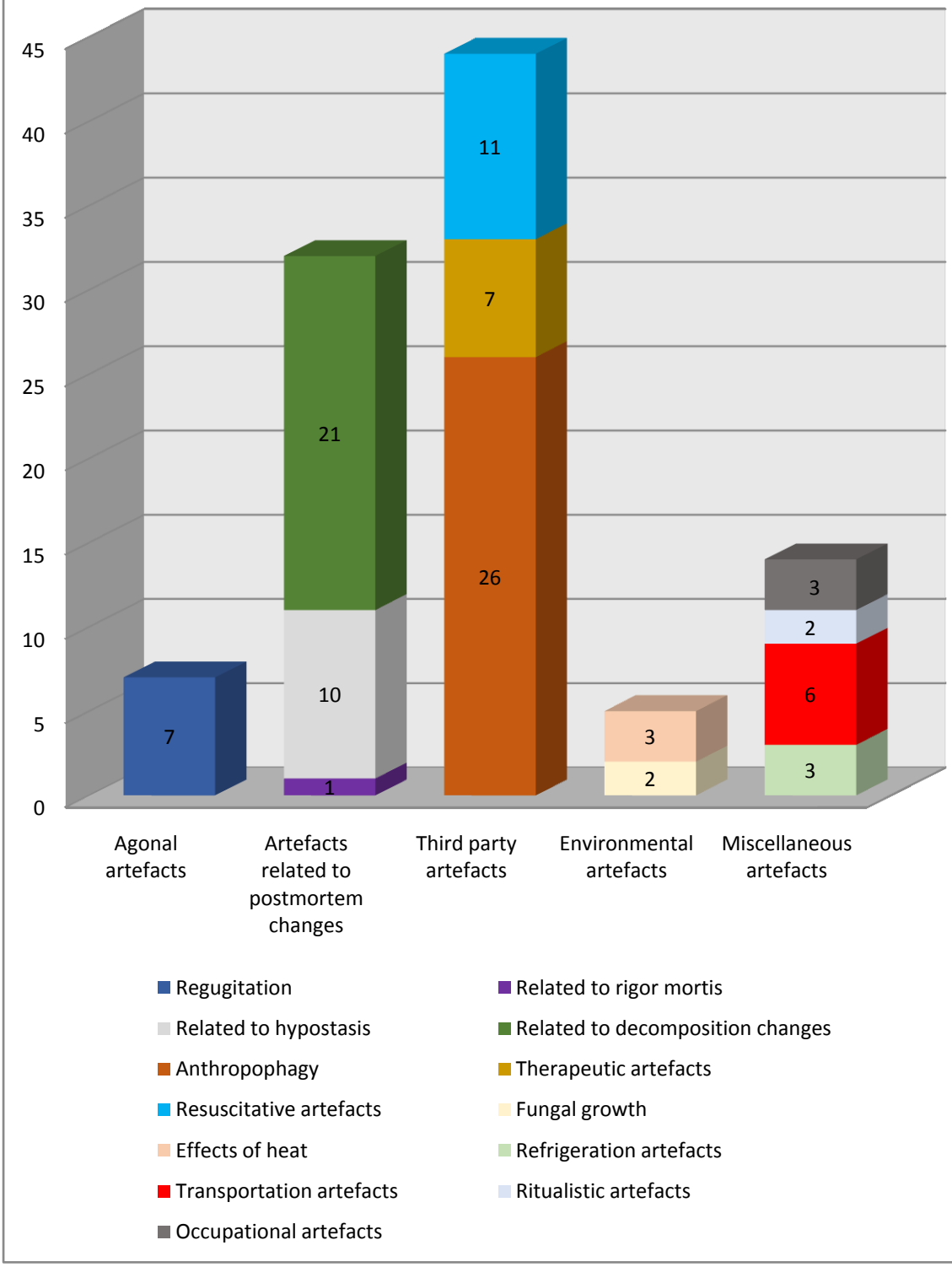


Table 14: Distribution of artefacts after death & before autopsy

Type of artifact	No. of cases		
Agonalartefacts		7 (6.9%)	7 (6.9%)
1. Regurgitation of gastric contents	7 (6.9%)		
Artefacts related to Post-Mortem changes			32 (31.4%)
Related to rigor mortis		1 (0.9%)	
2. Hypertrophy of heart	1 (0.9%)		
Related to hypostasis		10 (9.8%)	
3. Hypostatic hemorrhages	6 (5.8%)		
4. Internal organ contusion	4 (3.9%)		
Related to decomposition changes		21 (20.5%)	
5. Post-Mortem purge	6 (5.8%)		
6. Groove in the neck	2 (1.9%)		
7. Post-Mortem blisters	3 (2.9%)		
8. Genital damage	1 (0.9%)		
9. Pseudo-bruising	2 (1.9%)		
10. Scalp contusion	5 (4.9%)		
11. Skull - sutural separation	2 (1.9%)		
Third party artefacts			44 (43.1%)
Anthropophagy		26 (25.4%)	
12. Rodent bite	3 (2.9%)		
13. Ant bite	11 (10.7%)		
14. Maggots activity	12 (11.7%)		
Therapeutic artefacts		7 (6.8%)	
15. Drain wound	1 (0.9%)		

16. Laparotomy wound	1 (0.9%)		
17. Central line	2 (1.9%)		
18. Intubation	3 (2.9%)		
Resuscitative artefacts		11 (10.7%)	
19. Fracture ribs	7 (6.9%)		
20. Fracture sternum	2 (1.9%)		
21. Heart laceration	1 (0.9%)		
22. Liver laceration	1 (0.9%)		
Environmental artefacts			5 (4.9%)
23. Fungal growth	2 (1.9%)	2 (1.9%)	
Effects of heat		3 (2.9%)	
24. Heat rupture	1 (0.9%)		
25. Heat hematoma	1 (0.9%)		
26. Heat fracture	1 (0.9%)		
Miscellaneous artefacts	`		14 (13.7%)
Refrigeration artefacts		3 (2.9%)	
27. Pink lividity	3 (2.9%)		
Transportation artefacts		6 (5.8%)	
28. Transportation injury	2 (1.9%)		
29. Rigor mortis breakage	4 (3.9%)		
Others		5 (4.9%)	
30. Ritualistic foreign body	2 (1.9%)		
31. Occupational marks	3 (2.9%)		
Total			102 (100%)

Fig. 14.1: Distribution of major types of artefacts among those introduced after death & before autopsy



Among the 102 artefacts identified as introduced between death and autopsy, 7 were identified as agonal artefacts (6.9%), 32 were due to post-mortem changes(31.4%), 44 were third party artefacts (43.1%), while 5 were due to environmental causes (4.9%) and 14 cases accounted for miscellaneous artefacts (13.7%).

All the 7 cases of agonal artefacts were due to regurgitation of gastric contents into the respiratory tract viz., larynx and trachea.

Among the 32 artefacts that were due to post-mortem changes, 1 case was due to rigor mortis which mimicked hypertrophy of heart (0.9%). Artefacts related to post-mortem lividity was noted in 10 cases (9.8%) of which 6 were due to post-mortem hypostatic haemorrhages seen in the dependent parts of the body (5.8%) and 4 were due to hypostasis seen in the internal organs looking – like contusions (3.9%). The artefacts due to decomposition changes is seen in 21 cases accounting for 20.5% of total artefacts prior to autopsy.

The third-party artefacts were documented in 44 cases (43.1%) of which anthropophagy artefacts were noted in 26 cases (25.4%). Artefacts due to therapeutic measures in the Ante-Mortem period, prior to autopsy were noted in 7 cases (6.8%), while those artefacts from vigorous resuscitative measures in the perimortem period were noted in 11 cases (10.7%).

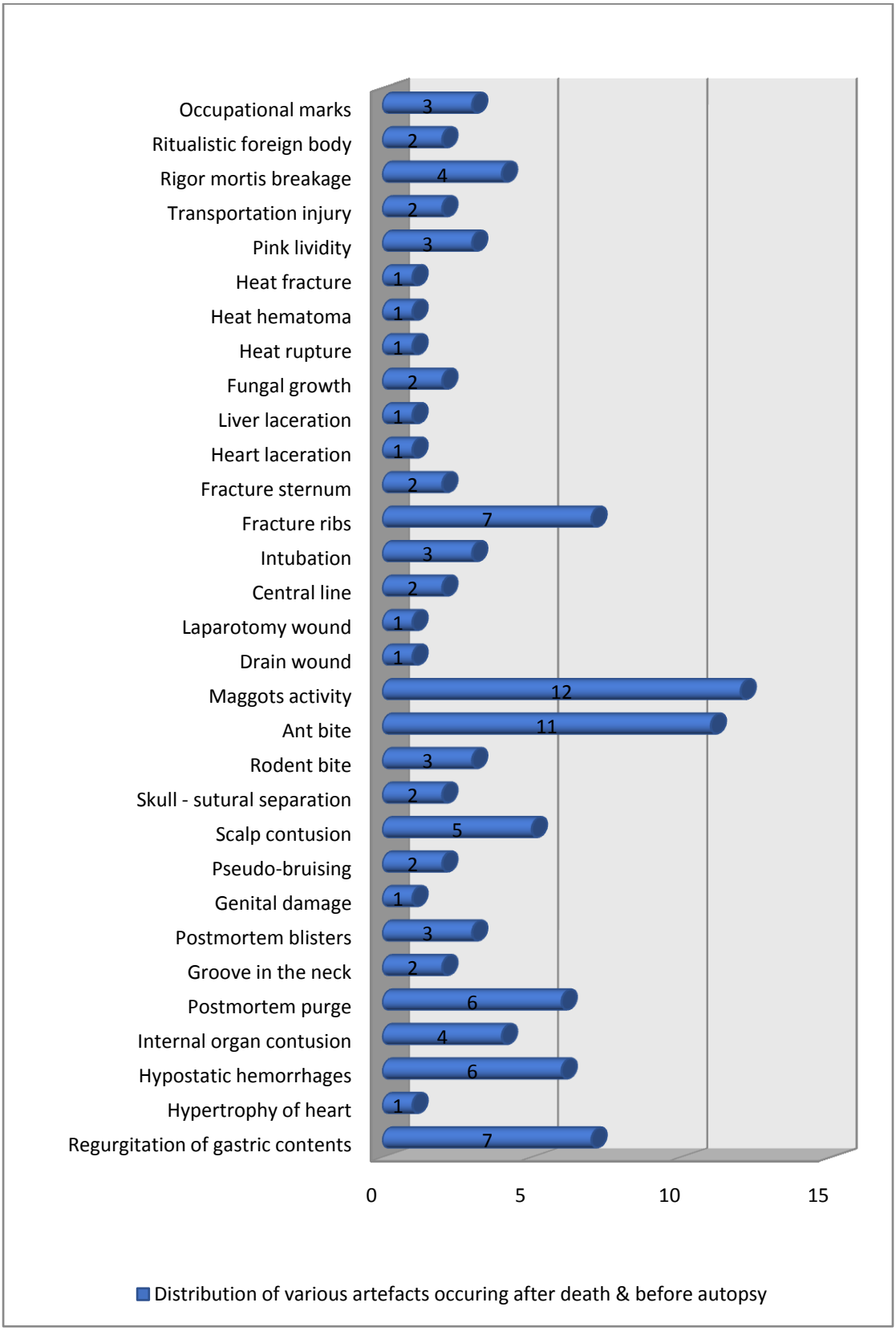
Artefacts due to environmental factors were noted in 5 cases (4.9%) of which 2 were due to fungal growth (1.9%) and 3 cases were seen due to effects of heat (2.9%).

The other miscellaneous artefacts which included the refrigeration and transportation artefacts were seen in 14 cases (13.7%), in which artefacts due to refrigeration was seen in 3 cases (2.9%) and artefacts due to transportation injuries were seen in 6 cases (5.8%).

Two other types of artefacts namely ritualistic artefacts and occupational artefacts were seen in this study, accounting for 5 cases in total (4.9%) of which ritualistic artefacts were seen in 2 cases (1.9%) and occupational artefacts in 3 cases (2.9%).

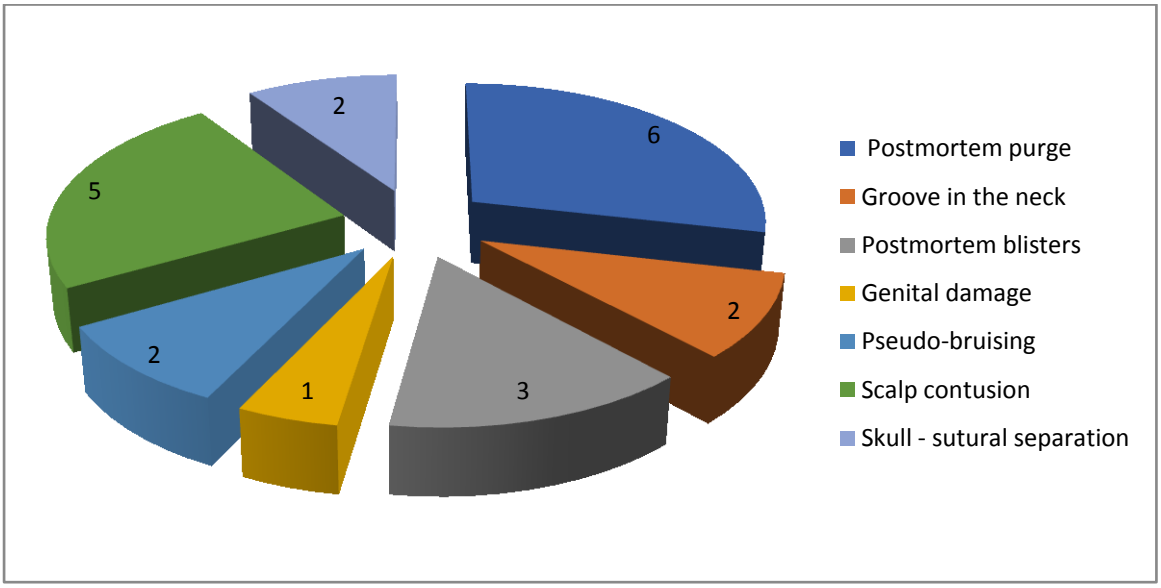
On analysing the major sub-types of artefacts introduced prior to autopsy, including agonal artefacts, artefacts due to post-mortem changes, third party artefacts, environmental artefacts and miscellaneous artefacts, the third-party artefacts were found to be more common followed by the artefacts due to post-mortem changes. Within the various causes for third-party artefacts as well as overall artefacts prior to autopsy, artefacts due to anthropophagy with 26 cases, were found to be highest seconded only by 5 cases by the artefacts due to decomposition changes with 21 cases.

Fig. 14.2 Distribution of various artefacts occurring after death & before autopsy



Among the individual artefacts noted prior to autopsy, maggots activity were the most common artefact accounting for 12 cases (11.7%) followed by ant bite marks which were seen in 11 cases (10.7%). They were followed by regurgitation of gastric contents and fracture of ribs due to resuscitative measures, noted in 7 cases each (6.9%).

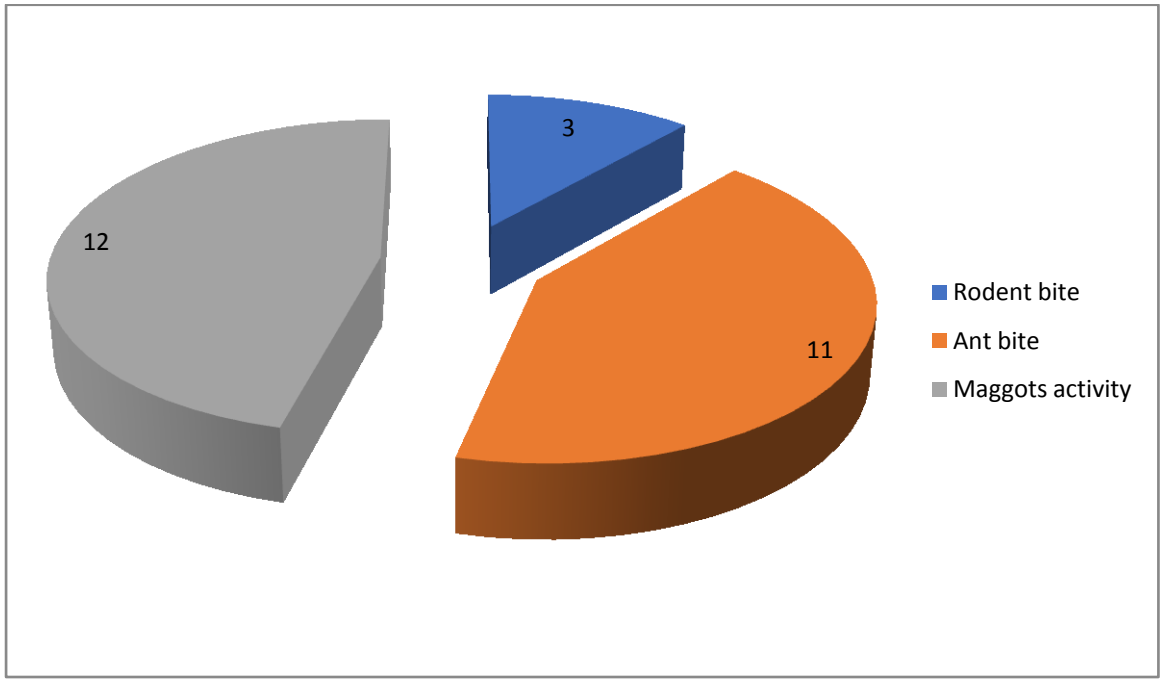
Fig. 14.3 Artefacts related to decomposition changes



The artefacts due to decomposition changes which were the second most common artefact, can include a wide range of artefacts. Of these, the oozing of Post-Mortem fluid or Post-Mortem purge, documented in 6 cases (5.8%) is the major artefact. This was followed by hypostasis, after decomposition, looking like contusion in the scalp which was noted in 5 cases (4.9%). The Post-Mortem blisters mimicking scald blisters were seen in 3 cases (2.9%). Gaseous distension causing false groove in the neck, pseudo-bruising in the internal organs and Post-Mortem sutural separation in skull all accounted for 2 cases each (1.9%). A rare case of genital prolapse by the gaseous distension of

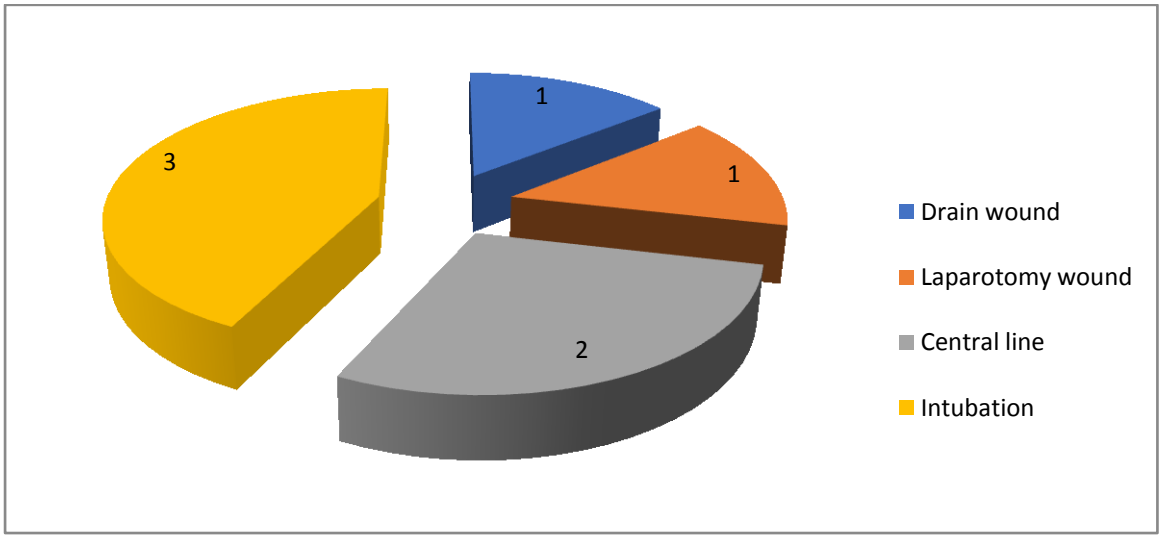
abdomen was noted (0.9%), where the prolapse of uterus simulated the appearance of scrotal sac and the sex of the body was documented as male by the investigator and Post-Mortem examination revealed the sex of the body to be female.

Fig. 14.4: Anthropophagy artefacts



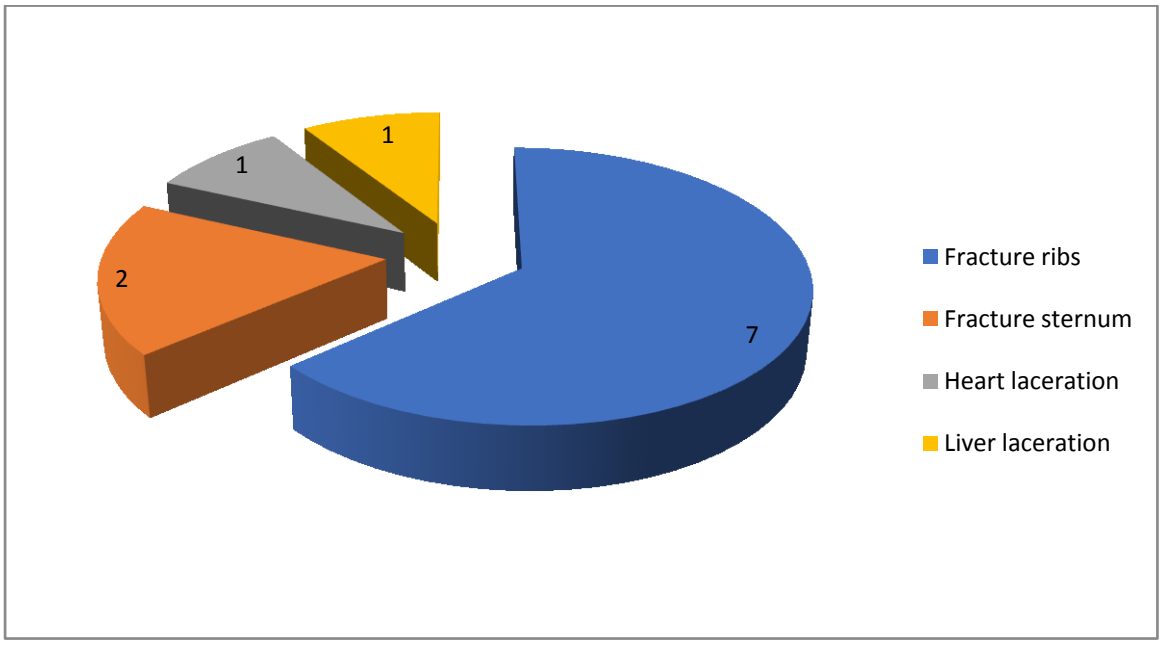
Depredation of the dead body by the maggots activity was seen in 12 cases (11.7%) and is the major contributor for anthropophagy artefacts. The ant bite abrasions were noted in 11 cases (10.7%), which was almost equal to the artefacts caused by maggots. 3 cases of rodent activity (2.9%) were documented in bodies that left in the open space and were left unseen by anyone for a considerable period.

Fig. 14.5: Therapeutic artefacts



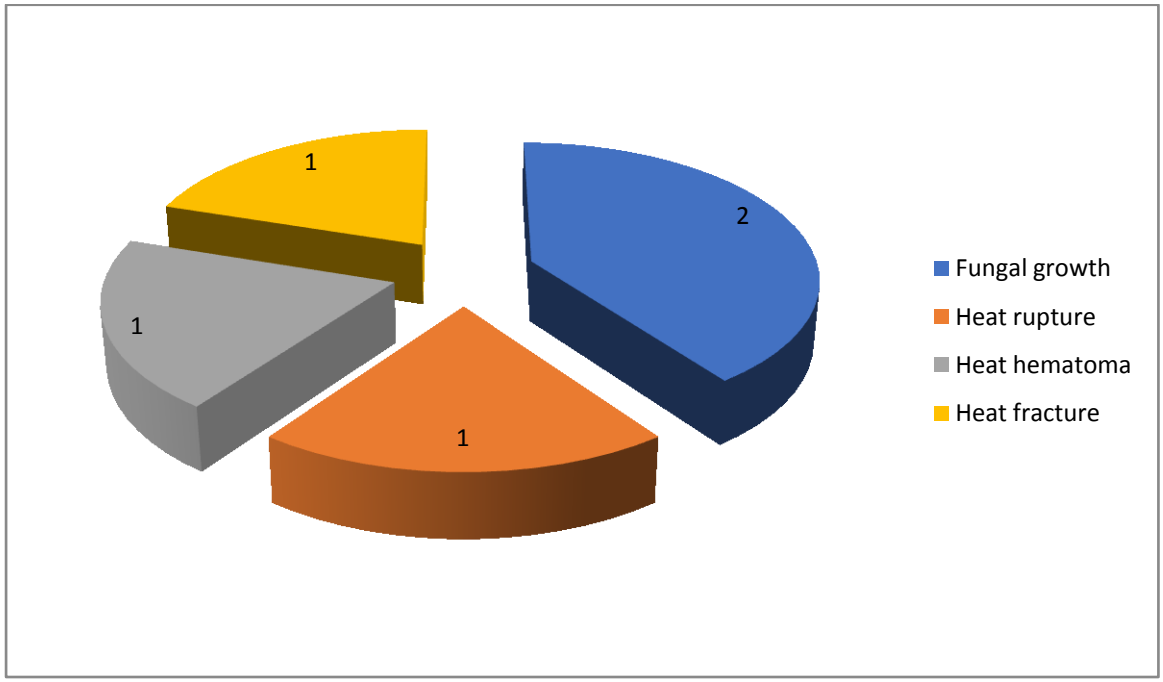
Injuries in the lips and mouth region were seen in 3 cases (2.9%) of therapeutic artefacts, followed by the central line contusion in the right side of neck in 2 cases (1.9%). Drain wound and laparotomy wound contributed as artefacts in 1 cases each (0.9%).

Fig. 14.6: Resuscitative artefacts



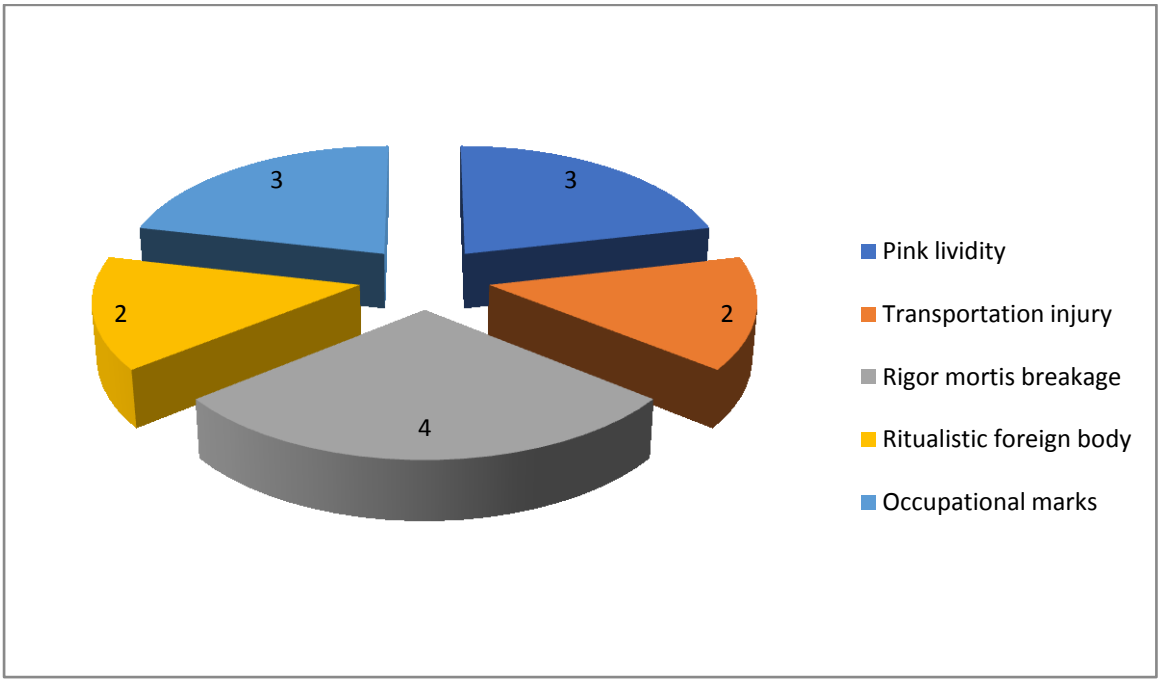
Almost 60% of the resuscitative artefacts is contributed by the fracture of ribs which were seen in 7 of the total 11 cases. The remaining artefacts included 2 cases of fractured sternum (1.9%), 1 case of liver laceration (0.9%) and 1 case of laceration in the heart (0.9%).

Fig. 14.7: Environmental artefacts



Among the major types of artefacts introduced in the dead body prior to autopsy, environment artefacts are the least. In this study, it includes 2 cases of fungal growth (1.9%) and Post-Mortem effects of heat noted in 3 cases (2.9%). The application of heat to a dead body can present with a multitude of artefacts of which, heat rupture is seen in the extremities of 1 case, heat hematoma in the other and heat fracture in the third case of Post-Mortem burns each accounting for 0.9%.

Fig. 14.8: Miscellaneous artefacts



The miscellaneous artefacts include those caused by the effects of refrigeration process or during the process of shifting the dead body from the scene of crime to the cold chamber or from cold chamber to the dissection table along with the two other artefacts caused by the ritualistic practices conducted on the deceased prior to autopsy and those occupation marks present in the body prior to death.

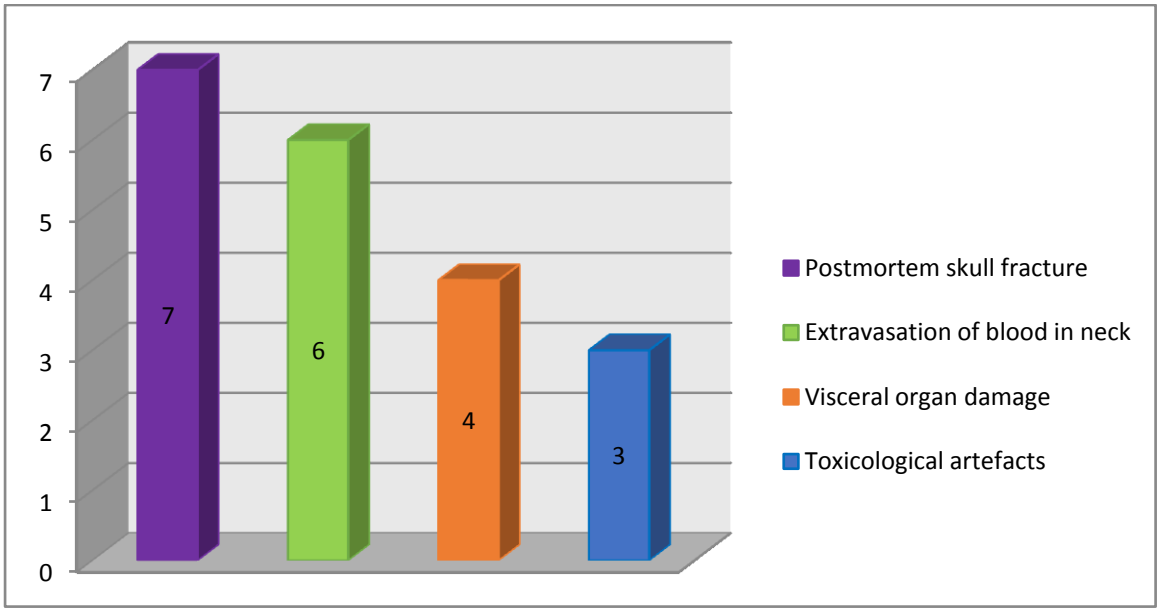
All the 3 cases of refrigeration artefacts were due to the pink lividity (2.9%). The transportation artefacts include 2 cases of trauma occurring in shifting process (1.9%) and 4 cases of rigor mortis breakage (3.9%). Foreign bodies like rice and betel leaf that was placed in the deceased's mouth as a ritual was noted in 2 cases (1.9%). Occupational marks such presence of dye, injury over the foot were noted in 3 cases (2.9%).

Table 15: Distribution of artefacts during autopsy

Type of artefact	No. of cases	Percentage
Post-Mortem skull fracture	7	35.0%
Extravasation of blood in neck	6	30.0%
Visceral organ damage	4	20.0%
Toxicological artefacts	3	15.0%
Total	20	100%

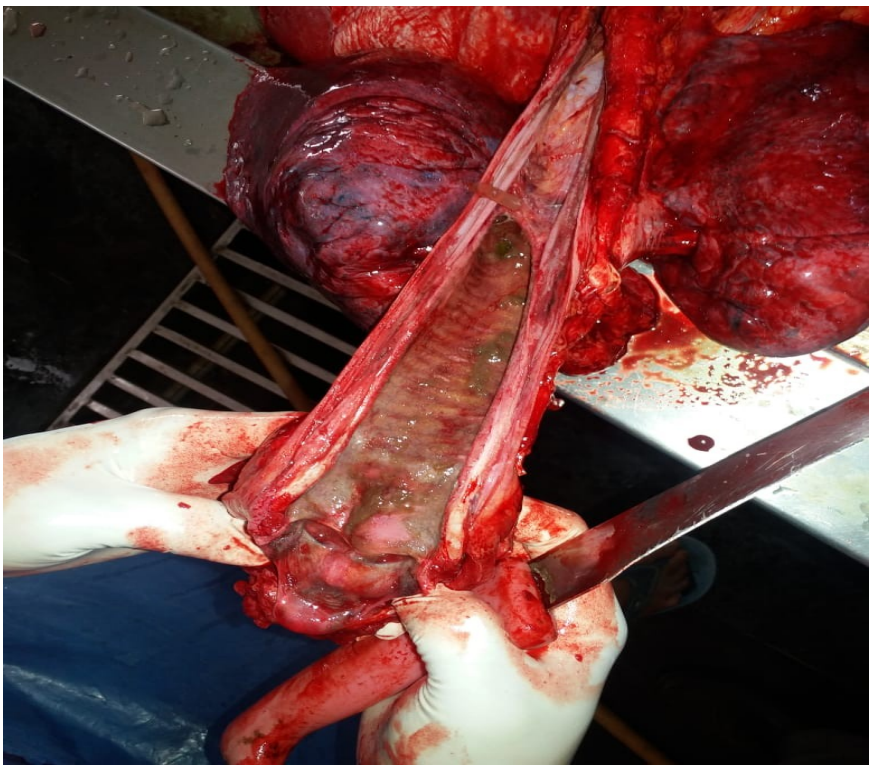
The artefacts occurring during the process of autopsy accounted for only 20 cases of which the maximum number of artefacts was due to the occurrence of Post-Mortem skull fracture while opening the skull cap. These skull fractures were documented in 7 cases accounting for 35.0% of the total artefacts occurring during autopsy.

Fig. 15: Distribution of artefacts during autopsy

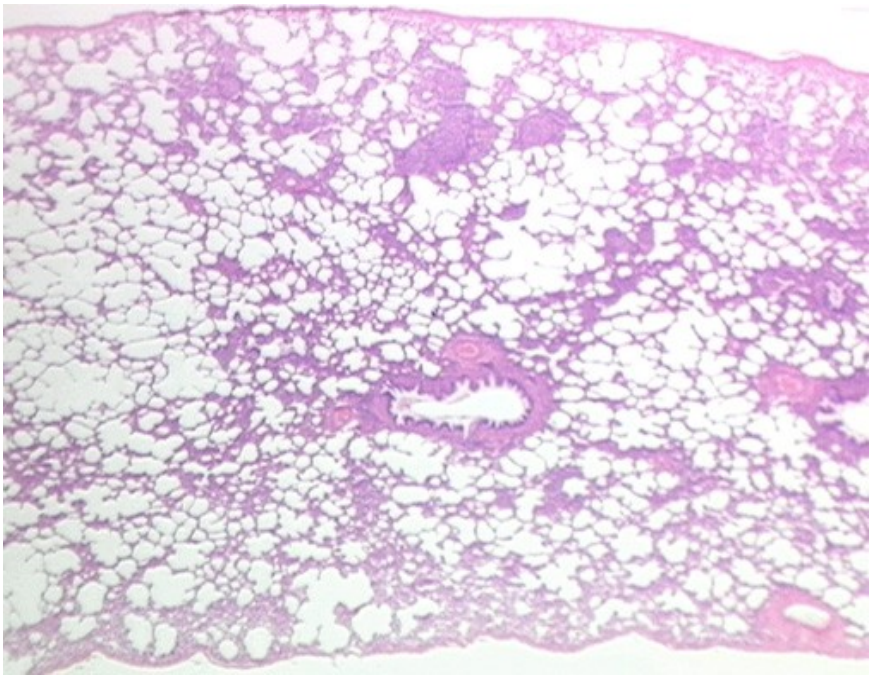


PHOTOGRAPHS

Photograph 1 (a): Regurgitated gastric contents in lumen of trachea

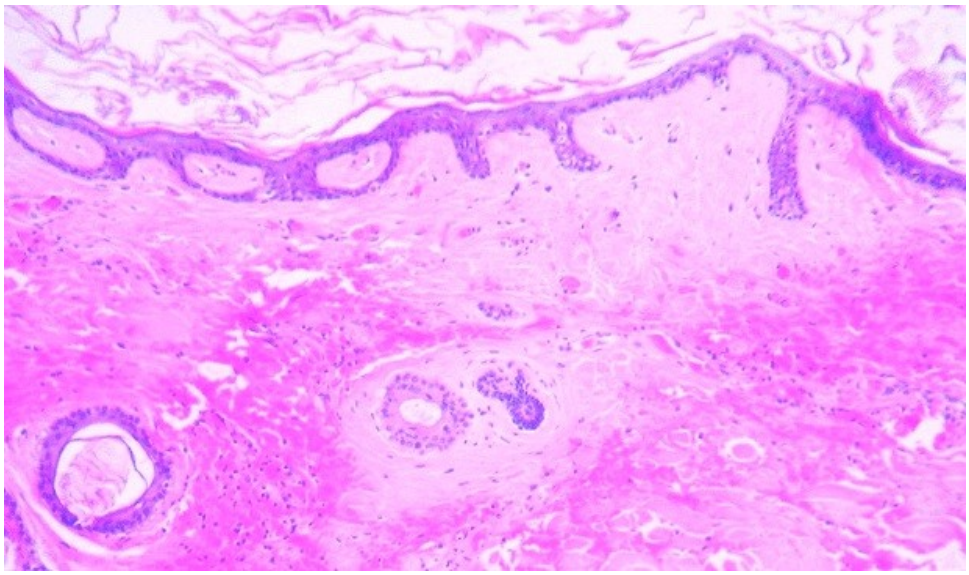


Photograph 1 (b): histopathology showing empty lumen of bronchi with mucosal secretions or inflammatory infiltrate



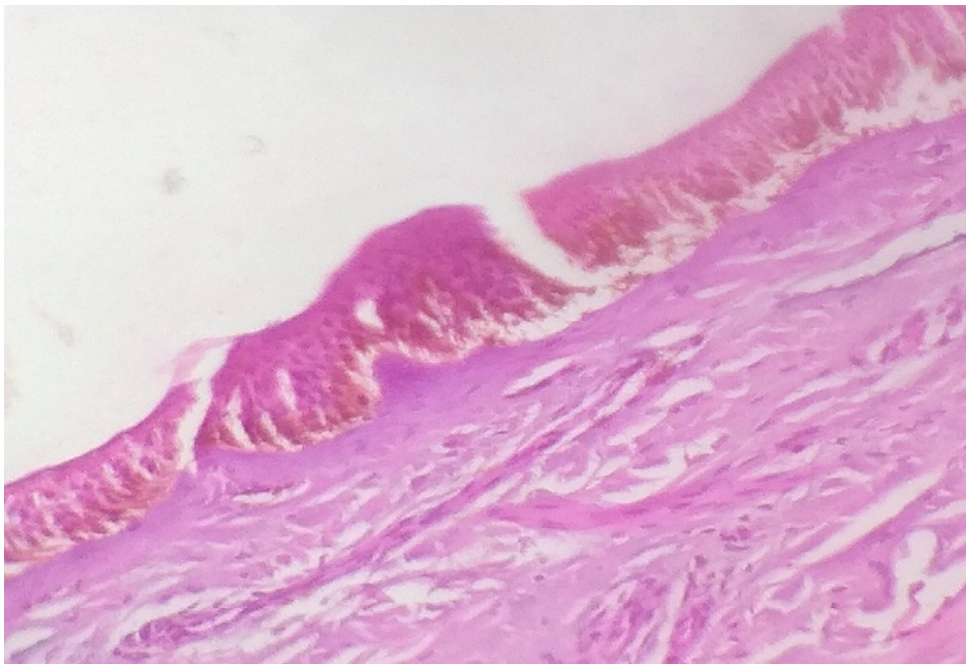
Photograph 2 (a): Hypostatic hemorrhages

Photograph 2 (a): Histopathology showing hemorrhage in the dermis of the skin



Photograph 3 (a): Ant abrasions

Photograph 3 (b): Histopathology showing epidermal breaks with no infitrate



Photograph 4: Occupational marks in a tailor

Photograph 5: Pink lividity

Photograph 6: <u>Intubation injury</u>

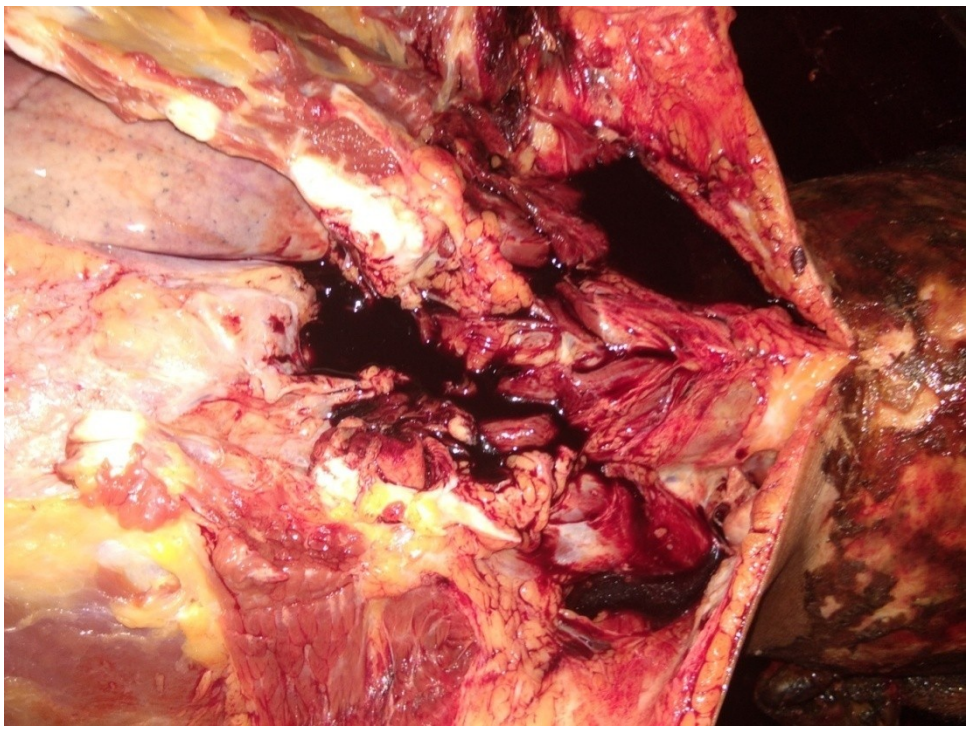
Photograph 7: <u>Foreign body in the mouth</u>

Photograph 8: <u>Scalp hypostasis in a decomposed body</u>

Photograph 9: <u>Drain wounds</u>

Photograph 10: Liver incised during dissection

Photograph 11: Extravasation of blood in neck

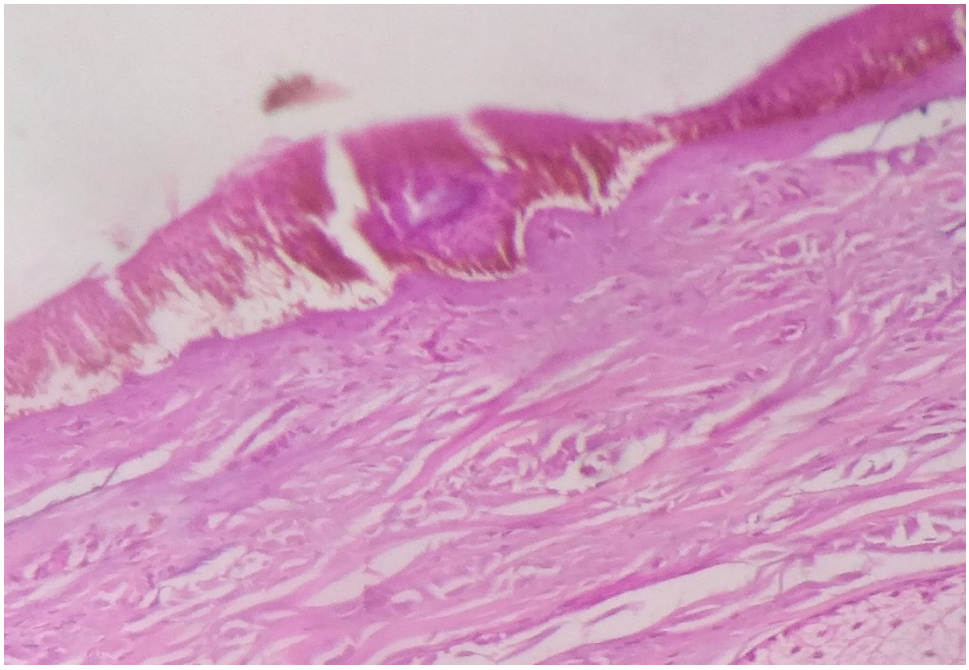


Photograph 12 (a): Genital artefact - female baby presenting as male

Photograph 12 (b): Female genitalia after reduction of prolapse

Photograph 13 (a): Post-mortem burns

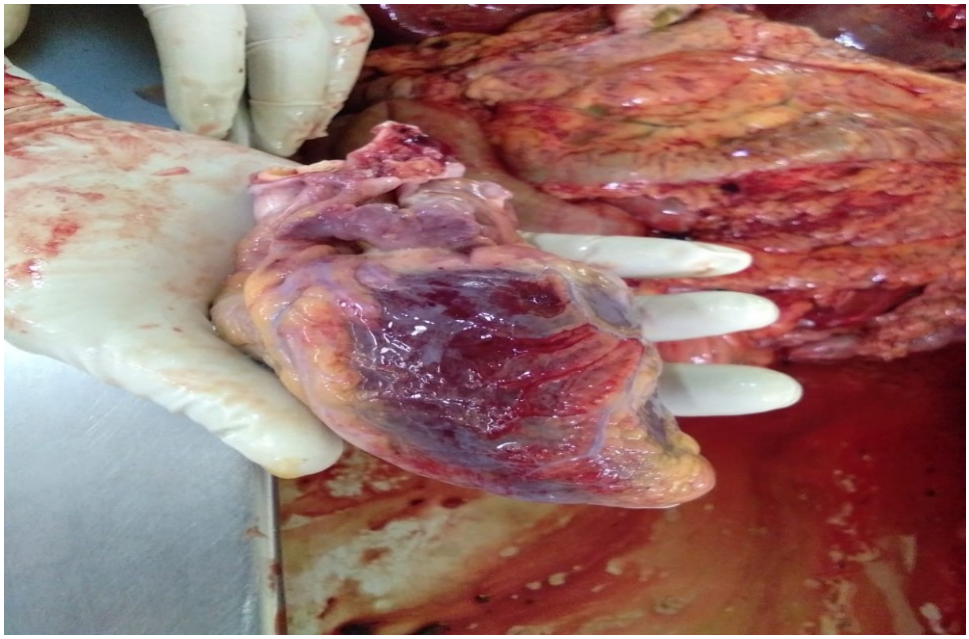
Photograph 13 (b): Histology of skin with superficial ulcers and no inflammatory infiltrate



Photograph 14: Fungal growth in mouth

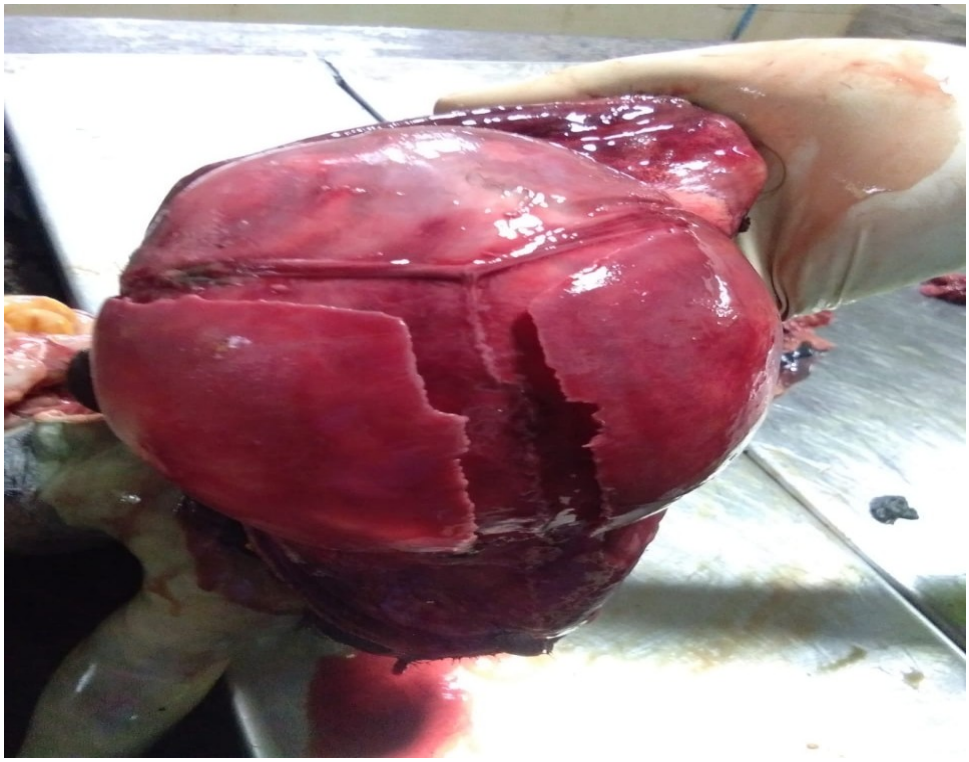
Photograph 15: Rodent activity

Photograph 16: <u>Resuscitation injury – heart laceration</u>



Photograph 17: <u>Resuscitation artefacts- multiple rib fractures</u>

Photograph 18: **Post-mortem sutural separation due to decomposition**



Photograph 19: **Maggots causing depredation in the right arm**

DISCUSSION

In the present study conducted in the Department of Forensic Medicine & Toxicology at Government Kilpauk Medical College & Hospital, Chennai-10, from January 2017 to December 2017, artefacts were noted in 122 out of the 358 studied cases, which accounted for a prevalence of 34%, which is one-third of the total cases. This rate is fairly higher than the prevalence of 5.13% documented by T.Sai Sudheer in his study conducted at Kurnool.[18] However, a similar rate of prevalence of 29.3% is noted by F.H.Mirza, in his study conducted at Karachi.[26]

In our study, maximum number of artefacts is noted in the age group of 41-50 years, followed by 51-60 years whereas very few cases were reported in the extremities of life. This finding is possibly due to the fact that the age group of 41-60 is more prone for death from a variety of causes like sudden death due to natural causes, road and railway accidents, work place deaths in comparison to the other age groups.

77% of the artefacts in the present study are noted in males while the rest 23% in the females. This is again due to the fact that males are more susceptible for death due to accidents, fall from height, assault and murder and even sudden death due to angina, myocardial infarction. Of the total male cases studied, artefacts were noted in 39.0% of the males while only 23.9% of the female cases had artefacts. This difference would indicate the male preponderance for artefact formation.

Artefacts are noted maximally in the dead bodies autopsied in the month of June (12.2%) followed by January and July (10.6%). This was in contrast the findings of T.Sai Sudheer, where May and April documented the maximum cases with artefacts.[18] by comparing the percentage of artefacts in each individual month, June (48.3%) is most susceptible month for artefacts followed by January (48.1%). Least number of artefacts were seen in the month of September and December (19.3%). This was in accordance with the findings in the study conducted at Kurnool.[18]

As per the India Meteorological Department[74], the climate of India is divided into four seasons and studied for the frequency of artefacts in each. Maximum number of artefacts were noted in the season of summer monsoon / south-west monsoon (36.8%) followed by summer season (28.6%). However summer is said to be the most prone season, seconded by the rainy/ monsoon season for artefact formation in the study of T.Sai Sudheer.[18] This variation is because the south-west monsoon is a long season staying for longer duration than summer. The higher incidence of artefacts in the summer monsoon season could be attributed to the following factors that accelerate decomposition:

a. Ideal environmental temperature conditions.
b. Gnawing by carnivores and rodents.
c. Easy infestation by maggots.
d. Delay in body being identified.
e. Delay in the post-mortem examination of the body.
f. Ideal conditions for infections.

g. Poor maintenance of cold storage.

In this study, artefacts were more commonly seen in sudden death case (38.5%), which was brought for autopsy with minimal history and unknown cause for death, followed by the burns and road traffic accidents. This result is because when the autopsy is approached with minimal history and no obvious clue pertain to the history, the suspicion is high and any finding however small could be interpreted as ante-mortem findings. The issue gets complicated by the therapeutic and resuscitative measures undertaken in the casualty when such cases are brought. Since our hospital is the tertiary care centre for burns management, a significant number of burns cases were documented with artefacts due to high load. The high prevalence of artefacts in road traffic accidents could be due to the fact that there is possibility of lot of contamination in the road side, and they might be left unattended for a long period of time.

Artefacts were more frequently encountered in the cases that died in the evening time, i.e., 6.01 p.m to 12 midnight (27.0%), as the deaths in this period might not be noticed immediately.

Pertaining to the post-mortem interval, maximum number of artefacts were seen those bodies that were autopsied 36 hours or more after death (31.9%), while very few were documented in the early post-mortem interval within 6 hours (13.1%). This gross difference is due to the formation of

decomposition artefacts and anthropophagy artefacts in the bodies autopsied 36 hours after death.

Similarly maximum number of artefacts is seen in the dead bodies found in the roadside (32.0%) and outside home environments (25.0%), which call for easy contamination and depredation by the predators. However significant number of artefacts was also noted in death inside the home (21.0%) and hospitals (16.0%).

Among the 122 artefacts 30 were noted in unknown bodies, which accounted for a significant percentage of 27.0%. The following factors increase the incidence of artefacts in the unknown dead bodies.

a. Most of the deaths are in road-side.
b. Most of them are unattended.
c. Increased chance of contamination and scavengers.
d. Delay in the notification of the death.
e. Delay in the identification of the deceased.
f. Delay in requesting the autopsy.

83% of the cases were brought dead to hospital with variety of histories. However 17.0% of artefacts were noted among the hospital treated deaths. This is important as the treatment in the hospital per se leads to a multitude of artefacts in the ante-mortem period like surgical wounds, intubation, central lines and IV lines, resuscitative measures that could cause a wide range of chest and abdomen injuries in the peri-mortem period.

Of the 122 cases with artefacts, 38.0% of the artefacts were found in the decomposed bodies as decomposition is the most common cause for artefact formation.

From this study it can be noted that the artefacts occurring prior to autopsy is the major type, documented in 102 cases (83.7%) where as the artefacts occurring during autopsy is noted only in 16.3% of cases. This result is supported by the findings of T.Sai Sudheer who identified only 3% of artefacts during autopsy procedure due to faulty techniques.[18] In the study conducted in Karachi, artefacts due dissection techniques were seen in 6.5% of the artefacts.[26] These findings prove that the artefacts were most commonly in the dead body before autopsy.

Among the various sub-types of artefacts occurring before autopsy, the third-party artefacts accounting for 43.1% is the most prevalent, followed by the artefacts due to post-mortem changes. However in the study of T.Sai Sudheer, artefacts due to decomposition is the major contributor (35%), insect and animal activity accounted for 15% and therapeutic and resuscitative artefacts for 12%.[18]

Within the various causes for third-party artefacts, artefacts due to insect & animal activity were found to be highest succeeding the decomposition artefacts only by 5 cases. Depredation by maggots, which could be included in both these sub-categories, is included under the anthropophagy artefacts giving them an upper hand over the decomposition artefacts.

In contrast to this, the study at Karachi showed decomposition artefacts (34.0%) lead over the anthropophagy artefacts (10.0%).[26]

All the 7 cases of agonal artefacts documented in this study are regurgitation artefacts, where the gastric contents were found in the lumen of larynx and trachea, simulating the aspiration of gastric contents. However on fine dissection of the respiratory tract, the food particles were not found beyond the bronchi and were confirmed by the histo-pathological examination of the lung tissue, which showed absence of inflammatory infiltrate and the food particles in the lumen of bronchioles which is similar to the findings of HS.Tatiya.[19]

Among the 31.4% of artefacts due to post-mortem changes, 1 case of artefact related to rigor mortis (0.9%) where the rigor of the myocardial muscles simulates ventricular hypertrophy, ruled out by taking detailed medical history of the deceased and second examination.

10 cases of artefacts due to hypostasis was seen which included 6 cases of post-mortem hypostatic haemorrhages, where in confluence of petechial haemorrhages is noted in the dependant parts of the body like lower limbs in case of hanging and the front of neck, chest and abdomen in case of a drowning that simulated ante-mortem contusion, ruled out by comparing with the inquest report from the police officers.

The remaining 4 cases were internal hypostasis that mimicked contusions which was ruled out by incising and washing under water.

20.5% of the artefacts before autopsy were decomposition artefacts of which post-mortem purge and scalp hypostasis mimicking contusion are the commonest, which was comparable with the prevalence of decomposition artefacts studied by FH.Mirza (34.0%)[26], T.Sai Sudheer (35.0%)[18}. However in a study conducted at Canada showed reduced prevalence of 7.83%.[22] This is due to the difference in the climatic conditions of the place.

The study by T.Sai Sudheer[18] and A Sauvageau[22] showed that the post-mortem purge of the decomposition fluid is the commonest decomposition artefact, which was in accordance with the findings of this study (5.8%). However, in the study at Karachi showed that deep grooves in the neck and skin splits due to decomposition are the commonest.[26] the decomposition artefacts are ruled out by comparing with the other findings and general condition of the body.

The anthropophagy artefacts were near equally shared by the depredation by maggots and ant bites with 3 rare cases of rodent activity. This was due to the urbanisation which decreases the access of the body to rodents. The percentage of anthropophagy artefacts (25.4%) is fairly high than those found by T.Sai Sudheer[18] and FH.Mirza[26], which was 15% and (10.0%) respectively.

The post-mortem ant-bites, rodent-bites and maggot activities are identified by the paleness of the abrasions and nibbling / gnawing at the margins of the injury. Hand-lens examination and histo-pathology helped in arriving at the conclusion.

In all the treat cases, the therapeutic or resuscitation artefacts are found which contributed to 17.5% of total artefacts of which 1.7% is contributed by vigorous resuscitation measures. Comparison with the treatment records is vital in identifying these artefacts of which fracture of ribs is the most frequent artefact noted (6.9%) which was comparable with the findings of the study done at Istanbul[51]. The study at Kurnool had 12% of artefacts due to therapeutic and resuscitative measures, while the study by FH.Mirza had 3.4%.

The environmental artefacts accounted for 4.9% of which 2 cases (1.9%) were due to fungal growth in the natural orifices, which were scraped and studied under light microscope and 3 cases (2.9%) were due to heat effects. This was in contrast to the findings of T.Sai Sudheer, which had 16% of artefacts due to burns. Despite more number of burns victims, this disparity in the findings is due to the fact that most of the burns cases studied are treated patients with superficial injuries. The 3 cases of artefacts due to burns are all noted in brought dead patients. Histopathology helped in determining these burns injuries as post-mortem.

The miscellaneous artefacts include 3 cases of refrigeration artefacts which showed pink lividity, immediately after taking it out of the cold chamber, which was ruled after thawing the body for an hour.

6 cases of transportation artefacts while shifting the body was documented of which 4 (3.9%) were due to breakage of rigor and 2 (1.9%) due to shifting injuries. These transportation artefacts accounted for 16.1% in the study of FH.Mirza[26] and 19% in the study of T.Sai Sudheer[18]. Taking proper details from the morgue workers pertaining to the injury in question helped in ruling out these artefacts.

2 cases of ritualistic foreign body, where in green leaves were stuffed in the mouth of the deceased and 3 cases of occupational artefacts were documented which were confirmed after putting detailed questionnaire to the relatives regarding the actual nature of the deceased's work.

Among the 20 cases of artefacts occurring during autopsy, most common includes 7 cases of post-mortem skull fracture (35%), which accounted for 5.7% of total artefacts, followed by extravasation of blood in the neck in 6 cases (30.0%). This is similar to the findings of FH.Mirza who noted post-mortem skull fracture by use of chisel in 15 bodies (6.5%).[26] However, T.Sai Sudheer noted that extravastion of blood in the neck, injury to neck structures and visceral organs were common and accounted for 3% of total artefacts.[18]

Damage to the visceral organs like heart, lungs, liver and brain were noted in 4 cases (20.0%). Toxicological artefacts like contamination of blood with pericardial fluid while sampling, contamination with gastric contents and preservation in a wrong preservative were noted in 3 cases that contributed for 15.0% of the artefacts introduced during autopsy. These artefacts are ruled out by paying close observation to the dissection procedure.

CONCLUSION

From this study it is evident that artefacts are a common phenomenon in the forensic practice. These artefacts could be from anywhere right from the process of death to shifting the body to the dissection table. In the mean, the source of artefacts could be anything from those therapeutic and resuscitative wounds to the process of dissection itself. The body would be subjected to trauma by a variety of predators, relatives and morgue attenders. Even the Post-Mortem changes which are inevitable and unavoidable in any dead body can present with enumerable artefacts. Hence it becomes impossible to bypass these artefacts.

'What the mind does not know, the eyes do not see.' – Socrates.

The real prudence lies in understanding these artefacts – their mechanism of formation, prevalence and distribution, possible preventive measures that could be employed to reduce their occurrence, differential diagnosis and how to rule out each one of them, thereby concluding the ante-mortem injury and the true cause of death.

The real fear is not in finding the artefacts, but in not finding them.

The most prone cases of autopsies for artefacts such as those in the season of summer monsoon, particularly in the months of January or June should be approached with great care. Special care must be taken in the dissection of unknown bodies, decomposed bodies which are brought as

sudden deaths as well as those treated hospital deaths to avoid misinterpretation of the possible artefacts.

To find what is right, one must know what is wrong to rule it out.

It is imperative of the autopsy surgeon to possess sufficient knowledge of the post-mortem artefacts which would be applied in their medico-legal work. Such knowledge would guide him to identify the right cause of death, manner of death, time since death and helps to avoid wrong suspicions of homicide or non-detection of a murder, thereby time, resources and effort would be channelized in the right direction.

The gain of knowledge of artefacts is mandatory to the autopsy surgeon, not only for providing justice to the deceased or the relatives or for aiding the investigating officer or the society in maintaining law and order, but also for himself; to cover one's own back. This knowledge will help him thwart any wrongful claim by the relatives or acquisition against him; it will act as a pillar that will support him while presenting testimony in the court of law; when the lawyers tries to demoralize his evidence.

Above all, knowing that he has not committed any mistake in the medico-legal work, that may cost the life of an innocent, will provide him peace of mind.

RECOMMENDATIONS

To the Autopsy Surgeon:

1. The knowledge of diverse types of artefacts that would present in any medico-legal autopsy is the foremost requirement for avoidance of misinterpretation.
2. To rule out artefacts, relevant history should be sought from the investigating officers pertaining to the circumstances of death, time and date of death, place of retrieval of the body stressing on the surrounding environment, position and condition of the body.
3. History from the relatives should be collected related to the previous illness and treatment history of the deceased.
4. History should be elicited pertain to the hospital admission prior to death including the therapeutic and resuscitative measures taken.
5. Discussing with the doctor who last treated the patient or referring the treatment details from the case sheets would be useful.
6. Whether body was preserved in cold storage or not.
7. History should be taken from the relatives about the maneuvers they did to retrieve the deceased.
8. Provision could be made to take the photographs of the dead body at the time of keeping inside the cold chamber and the same could be handed over to autopsy surgeon at the time of autopsy.

9. Extreme care should be employed while shifting the body to the cold chamber as well as to the dissection table or during removal of clothing. Any injury occurring in the process should be noted in the case sheet.
10. Both cold-chamber and dissection hall should be periodically fumigated, and proper measures should be taken to keep the mortuary and cold chamber insect, birds, animals and rodent-free.
11. Dissection should be conducted in an ideal mortuary set up with sufficient lightning.
12. Proper dissection techniques as advocated in the text books should be employed with proper instruments.
13. Although, an assistant may be directed to assist with the autopsy, it is essential that a full external examination has been performed by the autopsy surgeon with the findings recorded preferably in writing and diagrams and that, if the evisceration is performed by an assistant, that it is fully supervised by him so that any finding can be immediately observed and recorded. It is extremely difficult to go back on oneself to try to interpret a mark or finding once the body has been eviscerated by a second party.[76]
14. In cases where head injury is suspected, the use of chisel for opening the vault should be avoided.
15. The process of viscera collection should be closely monitored to prevent mixing and contamination of the samples.

16. The visceral samples for forensic science laboratory, pathology, microbiology and biochemistry should be promptly preserved with correct quantity of correct preservative, sealed and labelled under supervision before finishing the case so as, to prevent the toxicological artefacts.
17. Samples collected for histopathology or chemical examination should be noted in the P.M. report and if the body is sent for embalming, the same should also be documented.
18. Whenever necessary or doubtful, photography and videography of the autopsy should be done for future reference.
19. If need arises, senior colleagues can be consulted with relevant documents and doubtful findings by photography before giving an opinion.

To the Police:

1. It could be seen that as the post-mortem interval increases, the frequency of artefacts also increases. Hence, the chance of artefacts is more with decomposed bodies.
2. The Post-mortem examination should be conducted as early as possible for if the body is decomposed, there won't be much information to provide and the very purpose of conducting the autopsy will be lost.
3. Effort should be made to set up an ideal mortuary with adequate light, ventilation, abundant water supply and well-functioning cold storage facilities for preserving the body.

4. A police mortuary or improvement of the cold storages in the morgues, where in dead bodies can be preserved for at least 30 days in a freezer should be made.
5. Co-ordination between the three agencies involved in medico-legal work should be enhanced so that the evidences may not be lost.
6. Hence:
    a. Sufficient photographs at the scene of crime and presenting it to the autopsy surgeon at the time of autopsy.
    b. Early shifting of dead bodies to the cold chamber to prevent decomposition.
    c. Collecting detailed history relevant to the case.
    d. Subjecting the bodies for autopsy at the earliest.
    e. Faster analysis of samples sent for chemical analysis.

In general:

1. Qualified morgue technicians with training in handling the body, dissection and sample preservation can be brought out by creating a training course for the mortuary technicians.
2. Police personnel should be promptly trained regarding the artefacts formation and how to prevent or minimize them.
3. In reference to avoidance of erroneous post-mortem examination,

A doctor should better not take up the autopsy, which he does not feel competent to carry out. He should not be too proud or too ashamed to suggest

more skilled and experienced doctor, since a poor opinion is often worse than no opinion.[3]

All unusual findings must be meticulously examined and photographed and if need be, some experienced, better qualified colleague may be approached there and then.[3]

Many countries within the European Community go one step further by requiring two physicians to be present when medico-legal autopsies are being performed.[75]

All these suggestions by the renowned authors stress on the significance of medico-legal autopsy and the value of the correct opinion provided by an experienced autopsy surgeon in concluding the cause of death, there by leading the investigation in the right track.

In the current scenario, in India, due to lack of sufficient number of forensic experts, majority of the medico-legal autopsies are being carried out by the M.B.B.S qualified registered medical practitioners, working in the government hospitals, based on whose reports a large number of the medico-legal cases is conducted.

Hence, it becomes vital for the M.B.B.S graduates to gain sufficient experience by observing and getting trained in the field of medico-legal autopsy in their internship period. The Forensic Medicine postings during the

internship period must be made compulsory and not as optional, for a minimum period of 15 days, so that they exposed to a wide variety of cases.

The doctors who would be posted in medical colleges as well as Government hospitals, who would be handling the medico-legal work, should undergo a mandatory refresher course for medico-legal autopsy at the time of their joining.

Effort should be made by those who are in-charge to post at the least one qualified forensic expert in each district hospital and Government hospital, exclusively to deal with the medico-legal work so that the quality of the reports and opinion and hence justice is not compromised.

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ANNEXURE-I

PROFORMA

Name of the deceased :

Age of the deceased :

Sex of the deceased :

Month of death :

Tentative time of death :

Time interval of death reporting :

Place of retrieval of body :

Last rituals :

Medical treatment given :

Resuscitation measures :

Transportation injuries :

Cold storage :

Embalming :

Artefacts after death and before autopsy

Agonal artefact :

Resuscitation artefact :

Artefacts due to handling of body :

Refrigeration artefacts :

Anthrapophagy artefacts :

Embalming artefacts :

Artefacts of environment

Postmortem burning :

Postmortem corrosion :

Postmortem maceration :

Artefacts of decomposition :

Artefacts related to rigor mortis :

Artefacts related to hypostasis :

Artefacts in firearm wounds :

Miscellaneous artefacts :

Artefacts during autopsy

Postmortem fractures :

Artefacts during opening of skull cap :

Artefacts during dissection

Air in blood vessels :

Extravasation of blood :

Fracture of hyoid :

Injury to blood vessels :

Toxicological artefacts :

Miscellaneous artefacts :

SIGNATURE OF THE INVESTIGATOR :

SIGNATURE OF GUIDE :

ANNEXURE-II

ETHICAL COMMITTEE CLEARANCE CERTIFICATE

INSTITUTIONAL ETHICS COMMITTEE
GOVT. KILPAUK MEDICAL COLLEGE,
CHENNAI-10
Protocol ID. No. 03/2018 Meeting held on 08.01.2018

The Institutional Ethical Committee of Govt. Kilpauk Medical College, Chennai reviewed and discussed the application for approval "A STUDY OF POST-MORTEM ARTEFACTS IN DEATHS AUTOPSIED AT GOVT. KILPAUK MEDICAL COLLEGE CHENNAI IN THE YEAR 2017" submitted by Dr.J.S. RAGHU DEEPAN, Post Graduate in Forensic Medicine & Toxicology.
Govt. Kilpauk Medical College, Chennai-10.

The Proposal is **APPROVED.**

The Institutional Ethical Committee expects to be informed about the progress of the study any Adverse Drug Reaction Occurring in the Course of the study any change in the protocol and patient information /informed consent and asks to be provided a copy of the final report.

DEAN
Govt. Kilpauk Medical College,
Chennai-10.

ME 1 Sec> Ethical Committee

ANNEXURE-III

PLAGIARISM ANALYSIS REPORT

URKUND

Urkund Analysis Result

Analysed Document: artefacts.docx (D42419305)
Submitted: 10/11/2018 1:22:00 PM
Submitted By: jsraghu4@gmail.com
Significance: 9 %

Sources included in the report:

https://www.sciencedirect.com/science/article/pii/S2090536X16300430
https://link.springer.com/chapter/10.1007%252F978-1-4471-0699-9_4
https://www.scribd.com/presentation/387642507/Post-Mortem-Artefacts
http://www.forensicmed.co.uk/wounds/artefact-and-mimics/
https://emedicine.medscape.com/article/1680032-overview
http://www.doctoralerts.com/artefacts-artifact/
https://www.slideshare.net/farhanali911/negative-autopsy-amp-post-mortem-artifacts
https://jemds.com/data_pdf/1_Sai%20Sudheer---vij--,GU.docx
http://doi.org/10.4038/sljfmsl.v9i1.7801

Instances where selected sources appear:

50

ANNEXURE-IV

LIST OF ABBREVIATIONS USED IN THE MASTER CHART

1. Sex of the deceased:
    1-Male
    2- Female
    3- Transgender
2. History of the Case:
    RTA- Road Traffic Accident
    TTA- Train Traffic Accident
    FFH- Fall From Height
    BD- Brought Dead
3. Month of death:
    JAN-January
    FEB-February
    MAR-March
    APR- April
    MAY- May
    JUN- June
    JUL- July
    AUG- August
    SEP- September
    OCT- October
    NOV- November
    DEC- December
4. Season of death:
    1- Winter
    2- Summer
    3- South-West Monsoon/ Summer Monsoo
    4- North-East Monsoon
5. Time of death:
    1- Morning
    2-Afternoon
    3-Evening
    4-Night
    5-Not Known
6. PMI = post-mortem interval:
    1- Upto 6 Hrs
    2- 6-12 Hrs
    3- 12-24 Hrs
    4- 24-48 Hrs
    5- More than 36 Hrs
7. Place of retrieval of body:
    1-Inside Home
    2-Outside Home
    3-Road Side
    4-Bushes
    5-Water Bodies
    6-Hospital
    7-Others
8. Identity of the body:
    1- Unknown
9. Treatment status of the deceased:
    1-Treated
10. Condition of the dead body:
    1- Decomposed
11. Artefacts:
    1- Present

ANNEXURE-V

MASTER CHART

SL.NO	AGE	SEX	HISTORY	MONTH	SEASON	TIME	PMI	PLACE	IDENTITY	TREATED	CONDITION	ARTEFACTS	TYPE OF ARTEFACT
1	71-80	2	RTA	JAN	1	3	1	3				1	Ant Bite
2	11--20	2	BURNS	JAN	1	4	2	6		1			
3	21-30	1	FFH	JAN	1	5	4	2				1	Transportation Injury
4	21-30	2	HANGING	JAN	1	2	3	1					
5	71-80	1	BURNS	JAN	1	4	1	6		1			
6	51-60	1	RTA	JAN	1	3	2	3				1	Organ Contusion
7	41-50	2	BURNS	JAN	1	1	4	6		1			
8	41-50	1	TTA	JAN	1	2	5	3	1		1	1	PM Skull Fracture
9	31-40	1	BURNS	JAN	1	3	2	6		1			
10	51-60	1	TTA	JAN	1	4	5	3	1		1		
11	41-50	1	BD	JAN	1	1	1	3				1	Pink Lividity
12	41-50	1	RTA	JAN	1	5	4	3				1	Regugitation
13	61-70	2	BURNS	JAN	1	2	3	6		1			
14	31-40	1	BD	JAN	1	3	2	1				1	Ant Bite
15	61-70	1	SUSPICIOUS	JAN	1	4	4	1				1	PM Blister
16	21-30	1	HANGING	JAN	1	1	2	1					
17	31-40	1	BURNS	JAN	1	3	1	6		1		1	Central Line
18	21-30	2	HANGING	JAN	1	4	3	1					
19	41-50	2	RTA	JAN	1	1	4	3					
20	41-50	2	BD	JAN	1	5	5	2	1		1	1	PM purge
21	21-30	2	BURNS	JAN	1	4	2	6		1			
22	11--20	1	RTA	JAN	1	3	3	3				1	RM breakage
23	21-30	1	BURNS	JAN	1	1	1	6		1			
24	61-70	2	BURNS	JAN	1	2	4	6		1			
25	21-30	1	HANGING	JAN	1	3	1	1					
26	31-40	1	HANGING	JAN	1	5	5	1	1		1	1	Hypostatic Hemorrhages
27	61-70	1	BD	JAN	1	5	2	1				1	Ant Bite
28	1—10	1	ELECTROCUTION	FEB	1	1	1	2					
29	31-40	2	BURNS	FEB	1	2	3	6		1			
30	21-30	1	ELECTROCUTION	FEB	1	3	5	2	1		1	1	Maggots
31	71-80	1	BD	FEB	1	4	4	3					
32	51-60	1	BD	FEB	1	1	1	3					
33	31-40	1	HANGING	FEB	1	3	2	1				1	Ant Bite
34	31-40	1	HANGING	FEB	1	4	3	1					
35	11--20	1	HANGING	FEB	1	1	4	1					
36	41-50	1	HANGING	FEB	1	2	2	1					
37	31-40	1	BURNS	FEB	1	4	4	6		1			
38	61-70	1	BD	FEB	1	5	5	3	1		1	1	Pseudo-Bruising In Decomposition

39	41-50	2	BURNS	FEB	1	1	1	1					
40	31-40	1	BURNS	FEB	1	2	2	6		1			
41	61-70	1	BURNS	FEB	1	3	3	6		1			
42	41-50	1	BURNS	FEB	1	4	2	6		1		1	Intubation Injury
43	31-40	1	HANGING	FEB	1	1	1	1					
44	41-50	1	BD	FEB	1	1	5	2			1	1	Scalp Contusion
45	31-40	2	HANGING	FEB	1	2	4	1					
46	31-40	1	BURNS	FEB	1	3	1	6		1			
47	61-70	1	BD	FEB	1	4	5	3	1		1	1	Heat Hematoma
48	71-80	1	BURNS	FEB	1	1	2	6		1			
49	31-40	1	BURNS	FEB	1	3	2	6		1			
50	51-60	1	HANGING	FEB	1	4	3	1					
51	21-30	2	BURNS	FEB	1	1	3	6		1		1	Intubation Injury
52	21-30	2	BURNS	FEB	1	2	4	6		1			
53	41-50	2	BURNS	FEB	1	4	1	6		1		1	Fracture Ribs
54	1--10	2	BURNS	FEB	1	3	1	6		1			
55	31-40	1	BD	FEB	1	1	2	2					
56	61-70	1	HANGING	FEB	1	2	4	1					
57	61-70	1	BD	MAR	2	3	5	3	1		1	1	Sutural Seperation
58	21-30	1	HANGING	MAR	2	4	1	1					
59	31-40	1	HANGING	MAR	2	1	5	1			1	1	Hypostatic Hemorrhages
60	31-40	2	BURNS	MAR	2	1	1	6		1			
61	61-70	1	BD	MAR	2	2	2	2					
62	51-60	2	BURNS	MAR	2	3	4	6		1			
63	61-70	1	BD	MAR	2	4	3	2	1		1	1	Maggots
64	21-30	1	HANGING	MAR	2	1	4	1					
65	11--20	2	HANGING	MAR	2	3	5	1			1	1	Regugitation
66	31-40	1	HANGING	MAR	2	4	1	1					
67	41-50	2	BURNS	MAR	2	1	4	6		1		1	Heart Laceration
68	21-30	2	BD	MAR	2	2	2	3					
69	51-60	1	TTA	MAR	2	4	5	3	1		1		
70	51-60	1	HANGING	MAR	2	3	4	1				1	RM breakage
71	31-40	2	HANGING	MAR	2	1	1	1					
72	31-40	1	HANGING	MAR	2	2	2	1					
73	51-60	1	BD	MAR	2	5	5	1	1		1	1	Scalp Contusion
74	11--20	1	DROWNING	MAR	2	4	4	5					
75	51-60	1	BURNS	MAR	2	1	1	6		1		1	Fracture Ribs
76	31-40	1	HANGING	MAR	2	1	2	1					
77	41-50	1	BD	MAR	2	2	5	1			1		
78	21-30	2	BURNS	MAR	2	3	2	6		1		1	Fracture Ribs
79	51-60	2	HANGING	MAR	2	4	1	2					
80	21-30	1	TTA	MAR	2	5	5	3	1		1	1	Organ Contusion
81	51-60	1	HANGING	MAR	2	3	1	1					
82	41-50	1	POISON	MAR	2	4	2	2				1	Ant Bite
83	21-30	1	ELECTROCUTION	MAR	2	1	5	2			1		
84	11--20	2	BURNS	MAR	2	2	3	6		1		1	Liver Laceration

85	61-70	2	ASSAULT	MAR	2	4	4	1					
86	21-30	2	BURNS	APR	2	3	2	6		1			
87	21-30	2	HANGING	APR	2	1	3	1					
88	51-60	1	BD	APR	2	2	5	2	1		1	1	PM purge
89	11--20	2	BURNS	APR	2	3	1	6		1			
90	71-80	2	BD	APR	2	5	5	3	1		1	1	Maggots
91	1--10	1	BURNS	APR	2	1	1	6		1			
92	21-30	1	BURNS	APR	2	1	2	6		1			
93	51-60	1	BD	APR	2	2	5	2	1		1	1	Psuedo Bruising
94	11--20	2	BURNS	APR	2	3	3	6		1			
95	11--20	2	BURNS	APR	2	4	4	6		1			
96	11--20	1	TTA	APR	2	5	5	3	1		1		
97	51-60	1	BD	APR	2	3	5	2	1		1	1	Groove In Neck
98	21-30	1	HANGING	APR	2	4	4	1					
99	41-50	1	HANGING	APR	2	1	1	1					
100	41-50	1	BD	APR	2	2	2	1					
101	41-50	1	HANGING	APR	2	4	3	1					
102	21-30	2	BURNS	APR	2	3	1	6		1			
103	41-50	1	BD	APR	2	1	4	1				1	Rodent Bite
104	31-40	2	ASSAULT	APR	2	2	4	2				1	Extra Vasation Of Blood In Neck
105	21-30	1	BD	APR	2	3	4	1					
106	51-60	1	BD	APR	2	5	2	3	1		1	1	Scalp Contusion
107	41-50	1	TTA	APR	2	1	5	3	1		1	1	Pm Skull Fracture
108	51-60	1	HANGING	APR	2	1	3	1				1	Hypostatic Haemorrhages
109	81-90	2	BD	APR	2	2	5	2	1		1		
110	31-40	1	RTA	APR	2	3	4	3					
111	41-50	1	BD	APR	2	4	1	1					
112	21-30	1	HANGING	APR	2	1	2	1		1		1	Fracture Ribs
113	41-50	1	BD	APR	2	3	5	2			1	1	PM purge
114	41-50	1	BD	MAY	2	4	3	2				1	Organ Contusion
115	21-30	1	HANGING	MAY	2	1	1	1					
116	51-60	1	BD	MAY	2	5	5	1	1		1	1	Toxicological Artefacts
117	41-50	1	BD	MAY	2	4	2	1					
118	21-30	2	BURNS	MAY	2	3	3	6		1			
119	31-40	1	POISON	MAY	2	1	3	6		1		1	Intubation Injury
120	11--20	2	BURNS	MAY	2	2	3	2					
121	21-30	1	BURNS	MAY	2	3	4	6		1			
122	61-70	2	BURNS	MAY	2	4	4	6		1			
123	41-50	2	ASSAULT	MAY	2	1	2	2				1	Transportation Injury
124	61-70	1	BD	MAY	2	1	5	2			1	1	Refrigeration Artefacts
125	41-50	1	BD	MAY	2	2	2	1				1	Occupational Marks
126	11--20	2	BURNS	MAY	2	3	1	6		1			
127	21-30	1	RTA	MAY	2	4	3	3				1	Ant Bite
128	11--20	2	BURNS	MAY	2	1	1	6		1			
129	51-60	1	RTA	MAY	2	3	2	3			1	1	Maggots
130	1--9	2	BURNS	MAY	2	4	4	6		1			

131	21-30	1	HANGING	MAY	2	1	1	1					
132	41-50	2	TTA	MAY	2	2	5	3	1		1		
133	51-60	1	FFH	MAY	2	4	2	2				1	Visceral organ Damage
134	31-40	1	HANGING	MAY	2	3	3	1					
135	21-30	2	BURNS	MAY	2	1	4	3				1	Pm Skull Fracture
136	1--10	2	BURNS	MAY	2	2	1	6		1			
137	1--10	1	BURNS	MAY	2	3	2	6		1			
138	21-30	2	RTA	MAY	2	4	3	3					
139	41-50	1	BURNS	MAY	2	1	2	6		1			
140	41-50	1	BD	MAY	2	1	1	1					
141	31-40	2	BURNS	MAY	2	2	2	6		1			
142	31-40	1	BD	MAY	2	3	1	1					
143	71-80	1	HANGING	MAY	2	4	2	1					
144	11--20	1	BD	MAY	2	1	5	1			1	1	Extravasation Of Blood In Neck
145	41-50	1	FFH	MAY	2	3	4	2				1	Ant Bite
146	11--20	2	BURNS	MAY	2	4	2	6		1			
147	51-60	2	HANGING	JUN	3	1	1	1					
148	31-40	1	BURNS	JUN	3	2	2	6		1			
149	21-30	2	BURNS	JUN	3	4	1	6		1			
150	41-50	1	RTA	JUN	3	3	2	2				1	Pm Skull Fracture
151	21-30	2	BURNS	JUN	3	1	2	6		1			
152	51-60	2	BD	JUN	3	5	4	3				1	Pm Blisters
153	41-50	1	BURNS	JUN	3	3	4	6		1			
154	21-30	2	BD	JUN	3	4	2	1					
155	61-70	2	BD	JUN	3	1	5	3	1		1	1	Scalp Contusion
156	61-70	1	RTA	JUN	3	1	1	3					
157	21-30	1	RTA	JUN	3	2	2	3					
158	21-30	2	BURNS	JUN	3	3	4	6		1		1	Fracture Sternum
159	11--20	2	BURNS	JUN	3	4	2	6		1			
160	61-70	1	BD	JUN	3	1	1	3					
161	41-50	1	TTA	JUN	3	5	5	3	1		1	1	Maggots
162	41-50	1	HANGING	JUN	3	4	2	1				1	Hypostatic Haemorrhages
163	41-50	1	DROWNING	JUN	3	1	5	5			1	1	Sutural Separation
164	31-40	1	BD	JUN	3	2	3	1				1	Rodent Bite
165	31-40	1	HANGING	JUN	3	4	2	1					
166	21-30	1	HANGING	JUN	3	3	1	1					
167	41-50	1	BD	JUN	3	1	4	1					
168	31-40	2	BURNS	JUN	3	2	1	6		1		1	Fracture Ribs
169	21-30	2	BURNS	JUN	3	3	1	6		1			
170	61-70	1	HANGING	JUN	3	4	2	1					
171	61-70	2	RTA	JUN	3	1	5	3	1		1	1	Scalp Contusion
172	61-70	1	BD	JUN	3	1	5	3	1		1	1	PM purge
173	61-70	1	BD	JUN	3	2	2	1				1	Regugitation
174	81-90	1	FFH	JUN	3	3	3	2				1	RM breakage
175	71-80	2	RTA	JUN	3	4	2	3				1	Hypertrophy of heart
176	11--20	1	HANGING	JUN	3	1	3	1					

177	51-60	1	TTA	JUN	3	3	5	3	1		1	1	Groove In Neck
178	21-30	1	HANGING	JUL	3	4	4	1					
179	51-60	1	HANGING	JUL	3	1	1	1					
180	31-40	2	BURNS	JUL	3	2	2	6		1			
181	61-70	2	BURNS	JUL	3	4	3	6		1			
182	31-40	1	BD	JUL	3	3	4	3				1	Pm Blisters
183	21-30	1	BURNS	JUL	3	1	1	6		1		1	RM breakage
184	21-30	2	BURNS	JUL	3	2	2	6		1			
185	21-30	2	HANGING	JUL	3	3	3	1					
186	31-40	1	TTA	JUL	3	4	5	3	1		1	1	Toxicological Artefacts
187	21-30	1	HANGING	JUL	3	1	2	1					
188	61-70	1	RTA	JUL	3	1	3	3					
189	51-60	1	POISON	JUL	3	2	1	6		1		1	Laparotomy
190	21-30	2	HANGING	JUL	3	3	4	1					
191	61-70	1	BURNS	JUL	3	4	1	6		1		1	Fracture Sternum
192	51-60	1	BD	JUL	3	1	2	1					
193	51-60	1	HANGING	JUL	3	1	3	1					
194	31-40	2	BD	JUL	3	3	4	2				1	Ritualistic FB
195	11--20	1	HANGING	JUL	3	3	1	1					
196	51-60	1	BD	JUL	3	5	2	3	1		1	1	Maggots
197	51-60	1	BD	JUL	3	1	3	1					
198	61-70	1	BD	JUL	3	5	5	3	1		1	1	Regugitation
199	21-30	1	HANGING	JUL	3	4	4	1					
200	21-30	2	HANGING	JUL	3	3	3	1					
201	41-50	1	HANGING	JUL	3	1	2	1				1	Visceral organ Damage
202	41-50	1	SNAKE BITE	JUL	3	2	1	6		1		1	Central Line
203	11--20	1	HANGING	JUL	3	3	1	1					
204	41-50	1	HANGING	JUL	3	4	2	1					
205	71-80	1	BURNS	JUL	3	1	3	6		1		1	Pm Skull Fracture
206	31-40	1	HANGING	JUL	3	1	4	1					
207	21-30	2	BURNS	JUL	3	2	1	6		1			
208	51-60	1	HANGING	JUL	3	3	4	2				1	Extravasation Of Blood In Neck
209	21-30	1	BURNS	JUL	3	4	3	6		1			
210	21-30	1	POISON	JUL	3	1	2	1				1	Regugitation
211	31-40	1	HANGING	JUL	3	3	4	1					
212	21-30	3	HANGING	JUL	3	4	1	1					
213	21-30	2	BURNS	JUL	3	1	1	6		1			
214	41-50	2	BURNS	AUG	3	2	2	6		1			
215	61-70	2	BD	AUG	3	5	5	3	1		1	1	Ritualistic FB
216	11--20	2	HANGING	AUG	3	3	2	1					
217	21-30	1	BD	AUG	3	1	2	2					
218	21-30	1	ELECTROCUTION	AUG	3	2	3	1				1	Extravasation Of Blood In Neck
219	41-50	1	BD	AUG	3	3	2	2					
220	21-30	1	TTA	AUG	3	4	3	3				1	Fungal Growth
221	41-50	1	BD	AUG	3	1	2	2				1	Extravasation Of Blood In Neck
222	31-40	1	HANGING	AUG	3	1	1	1					

223	21-30	2	BURNS	AUG	3	2	2	6		1			
224	51-60	1	FFH	AUG	3	3	3	2				1	Pm Skull Fracture
225	1--10	2	DROWNING	AUG	3	4	4	5	1		1	1	Genital Damage
226	11--20	2	HANGING	AUG	3	1	1	1					
227	41-50	1	BURNS	AUG	3	3	2	6		1			
228	61-70	1	BD	AUG	3	4	3	1				1	Occupational Marks
229	41-50	1	BD	AUG	3	1	4	1					
230	11--20	1	BURNS	AUG	3	2	1	6		1			
231	31-40	1	HANGING	AUG	3	4	2	1					
232	51-60	1	BD	AUG	3	3	5	3			1	1	Ant Bite
233	31-40	1	HANGING	AUG	3	1	2	1					
234	11--20	1	RTA	AUG	3	2	3	3					
235	41-50	1	BURNS	AUG	3	3	1	6		1			
236	41-50	1	RTA	AUG	3	4	2	3					
237	51-60	1	RTA	AUG	3	1	3	3				1	Organ Contusion
238	21-30	2	HANGING	AUG	3	1	4	1					
239	21-30	1	RTA	AUG	3	5	5	3			1	1	Maggots
240	1--10	2	SUSPICIOUS	AUG	3	3	1	4				1	Regugitation
241	51-60	1	HANGING	SEP	3	4	2	1					
242	51-60	2	BURNS	SEP	3	1	3	6		1			
243	51-60	1	BURNS	SEP	3	3	3	6		1			
244	41-50	2	BD	SEP	3	5	5	2			1	1	Hypostatic Haemorrhages
245	41-50	1	HANGING	SEP	3	1	2	1					
246	41-50	1	BD	SEP	3	2	3	1					
247	51-60	1	BD	SEP	3	4	4	2					
248	51-60	1	BURNS	SEP	3	3	1	6		1			
249	11--20	2	HANGING	SEP	3	1	2	1					
250	31-40	1	RTA	SEP	3	2	3	3				1	Refrigeration Artefacts
251	31-40	1	BD	SEP	3	3	1	2					
252	51-60	2	BURNS	SEP	3	4	2	6		1			
253	51-60	1	HANGING	SEP	3	1	3	1					
254	31-40	1	BD	SEP	3	5	5	7	1		1		
255	41-50	1	BD	SEP	3	2	1	2					
256	51-60	2	HANGING	SEP	3	3	2	1					
257	11--20	2	BURNS	SEP	3	4	4	6		1			
258	51-60	1	BURNS	SEP	3	1	3	6		1			
259	11--20	1	HANGING	SEP	3	3	4	1					
260	41-50	1	HANGING	SEP	3	4	1	1					
261	31-40	1	HANGING	SEP	3	1	2	1					
262	21-30	1	BURNS	SEP	3	2	2	6		1			
263	21-30	1	BURNS	SEP	3	4	3	6		1			
264	41-50	1	TTA	SEP	3	5	5	3	1		1	1	Maggots
265	41-50	1	BD	SEP	3	1	1	3				1	Toxicological Artefacts
266	11--20	2	ASSAULT	SEP	3	2	1	2					
267	41-50	1	HANGING	SEP	3	3	1	1					
268	31-40	1	SUSPICIOUS	SEP	3	4	5	3			1		

269	61-70	2	BURNS	SEP	3	1	3	6		1			
270	31-40	1	BD	SEP	3	1	1	2				1	Ant Bite
271	31-40	1	SUSPICIOUS	SEP	3	2	2	2				1	Ant Bite
272	41-50	2	RTA	SEP	3	3	4	3					
273	1--10	2	BD	OCT	4	4	2	1					
274	31-40	2	HANGING	OCT	4	1	3	1					
275	21-30	2	BURNS	OCT	4	3	1	6		1			
276	61-70	2	BURNS	OCT	4	4	2	6		1			
277	11--20	2	BURNS	OCT	4	1	4	6		1			
278	21-30	1	BD	OCT	4	2	1	2				1	Regugitation
279	41-50	1	RTA	OCT	4	4	2	3					
280	41-50	1	FFH	OCT	4	3	3	3					
281	11--20	1	RTA	OCT	4	1	2	6		1			
282	31-40	1	HANGING	OCT	4	2	4	1					
283	31-40	1	HANGING	OCT	4	3	1	1					
284	11--20	2	BURNS	OCT	4	4	2	6		1			
285	11--20	2	HANGING	OCT	4	1	3	1					
286	41-50	1	BURNS	OCT	4	1	2	6		1			
287	71-80	1	BD	OCT	4	5	5	2	1		1	1	PM purge
288	21-30	1	BD	OCT	4	3	4	2				1	Rodent Bite
289	21-30	2	HANGING	OCT	4	4	1	1					
290	21-30	1	DROWNING	OCT	4	1	5	5			1	1	Maggots
291	11--20	2	HANGING	OCT	4	3	2	1					
292	61-70	2	HANGING	OCT	4	4	3	1					
293	21-30	1	HANGING	OCT	4	1	1	1					
294	31-40	1	BD	OCT	4	2	2	1					
295	51-60	1	BD	OCT	4	4	1	2					
296	41-50	1	BURNS	OCT	4	3	3	6		1		1	Pm Skull Fracture
297	61-70	1	BD	OCT	4	1	4	3					
298	41-50	1	HANGING	OCT	4	2	3	1					
299	51-60	1	RTA	OCT	4	3	3	3				1	Visceral organ Damage
300	21-30	2	RTA	OCT	4	4	1	6		1		1	Drain Wound
301	21-30	1	BURNS	OCT	4	1	3	6		1		1	Fracture Ribs
302	41-50	1	BD	NOV	4	1	4	2					
303	11--20	2	BD	NOV	4	2	3	2					
304	31-40	1	BD	NOV	4	3	4	3					
305	31-40	1	FFH	NOV	4	4	2	2					
306	21-30	2	HANGING	NOV	4	1	1	1					
307	11--20	1	DROWNING	NOV	4	3	3	5			1	1	Maggots
308	31-40	1	TTA	NOV	4	4	4	3				1	Ant Bite
309	41-50	1	BD	NOV	4	1	2	2					
310	11--20	2	BURNS	NOV	4	2	3	1				1	Heat Rupture
311	51-60	1	BD	NOV	4	4	1	1					
312	61-70	1	BD	NOV	4	5	5	1	1		1	1	Maggots
313	21-30	2	HANGING	NOV	4	1	2	1					
314	11--20	1	TTA	NOV	4	2	5	3	1		1	1	Pm Skull Fracture

315	41-50	1	BD	NOV	4	3	3	2					
316	41-50	1	HANGING	NOV	4	4	2	1					
317	31-40	1	ELECTROCUTION	NOV	4	1	4	6		1			
318	51-60	1	TTA	NOV	4	5	5	3	1		1		
319	31-40	1	HANGING	NOV	4	2	4	1					
320	51-60	1	BD	NOV	4	3	2	2				1	Occupational Marks
321	31-40	1	TTA	NOV	4	4	3	3					
322	21-30	1	HANGING	NOV	4	1	4	1					
323	51-60	1	HANGING	NOV	4	3	2	1					
324	51-60	1	BURNS	NOV	4	4	3	6		1			
325	31-40	1	FFH	NOV	4	1	4	4			1	1	Maggots
326	21-30	1	HANGING	NOV	4	2	1	1					
327	21-30	2	BURNS	NOV	4	4	2	6		1			
328	51-60	2	HANGING	DEC	4	3	2	1					
329	11--20	1	BURNS	DEC	4	1	3	6		1			
330	21-30	2	BURNS	DEC	4	2	3	6		1			
331	1--10	1	POISON	DEC	4	3	2	6		1			
332	11--20	1	BD	DEC	4	4	2	4					
333	31-40	1	RTA	DEC	4	1	1	6		1			
334	31-40	1	BD	DEC	4	1	2	2					
335	41-50	2	BURNS	DEC	4	2	2	6		1			
336	51-60	2	BURNS	DEC	4	3	4	6		1			
337	51-60	1	BD	DEC	4	4	4	2					
338	31-40	1	HANGING	DEC	4	1	3	1					
339	41-50	1	HANGING	DEC	4	3	4	1					
340	41-50	1	BD	DEC	4	4	4	2					
341	21-30	1	BURNS	DEC	4	1	4	6		1			
342	31-40	2	BURNS	DEC	4	2	2	6		1			
343	61-70	2	BD	DEC	4	5	5	3	1		1	1	PM purge
344	11--20	2	HANGING	DEC	4	3	3	1				1	Hypostatic Haemorrhages
345	41-50	1	BURNS	DEC	4	1	3	6		1			
346	21-30	2	BURNS	DEC	4	2	2	6		1			
347	51-60	2	BURNS	DEC	4	3	1	4				1	Heat Fracture
348	41-50	1	BURNS	DEC	4	4	4	6		1			
349	41-50	1	BD	DEC	4	1	2	2					
350	31-40	1	BD	DEC	4	1	1	3					
351	51-60	1	BD	DEC	4	2	3	2				1	Visceral organ damage
352	41-50	1	POISON	DEC	4	3	4	6		1		1	Fracture Ribs
353	71-80	2	BURNS	DEC	4	4	2	1		1			
354	21-30	1	HANGING	DEC	4	1	1	1					
355	11--20	2	HANGING	DEC	4	3	5	1			1		
356	51-60	1	BD	DEC	4	4	2	2				1	Fungal Growth
357	31-40	2	BURNS	DEC	4	1	3	6		1			
358	21-30	2	BURNS	DEC	4	1	4	6		1			